



Estd:1980

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

Regulation: R20		II / 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
B20BS2105	Numerical Methods and Linear Algebra	BS	3	3	0	0	30	70	100
B20AM2101	Mathematical Foundations for Machine Learning	ES	3	3	0	0	30	70	100
B20AM2102	Object Oriented Programming with JAVA	PC	3	3	0	0	30	70	100
B20AM2103	Database Management Systems	PC	3	3	0	0	30	70	100
B20AM2104	Introduction to Artificial Intelligence and Machine Learning	PC	3	3	0	0	30	70	100
B20AM2105	Object Oriented Programming with JAVA Lab	PC	1.5	0	0	3	15	35	50
B20AM2106	Database Management Systems Lab	PC	1.5	0	0	3	15	35	50
B20AM2107	Introduction to Artificial Intelligence and Machine Learning Lab	PC	1.5	0	0	3	15	35	50
B20AM2108	Web Application Development Lab (Skill Oriented Course-I)	SOC	2	1	0	2	--	50	50
B20MC2103	English Proficiency	MC	0	2	0	0	--	--	--
B20AM2109	Community Service Project	PR	4	--	--	--	--	100	100
TOTAL			25.5	18	0	11	195	605	800

Code	Category	L	T	P	C	I.M	E.M	Exam
B20BS2105	BS	3	--	--	3	30	70	3 Hrs.

NUMERICAL METHODS AND LINEAR ALGEBRA

(For AIML)

Course Objectives: Students are expected to learn

1	Numerical methods to solve algebraic and transcendental equations. The concept of interpolation and its use for equally and unequally spaced data points.
2	Methods for numerical evaluation of integrals and for solving first order ODEs. (IVP)
3	Dimension, Basis, Orthogonality and Projections in Vector spaces
4	Gram-Schmidt orthogonalization and QR decomposition Methods
5	Eigen values, Eigen vectors and Linear Transformations
6	Singular value decomposition and Principal component analysis

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

S.No	Outcome	Knowledge Level
1	Find a real root of algebraic and transcendental equations. Fit an interpolation formula and perform interpolation for equally spaced and unequally spaced data,	K3
2	Evaluate numerically certain definite integrals Solve a first order ordinary differential equation by Euler and RK methods.	K3
3	Describe linear combinations, Dimensions and Vector Space,	K3
4	Describe Orthogonal Projection, Apply Gram-Schmidt orthogonalization and QR decomposition methods	K3
5	Calculate Rank and Nullity of Linear Transformations and Finding distance in inner product	K3
6	Describe Singular value decomposition and Principal component analysis with certain applications	K3

SYLLABUS

UNIT-I (10 Hrs)	<p>Solution of Algebraic and Transcendental Equations: Introduction, Bisection method, Method of false position, Iteration method & Newton-Raphson method.</p> <p>Interpolation: Introduction, forward differences, backward differences and Central differences. Differences of a polynomial, Newton's forward and backward interpolation formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange interpolation formulae.</p>
UNIT-II (12Hrs)	<p>Numerical Integration and solution of Ordinary Differential equations: Trapezoidal rule, Simpson's $1/3^{\text{rd}}$ rule. Solution of first order ordinary differential equations by Taylor's method, Picard's method, Euler's method, Modified Euler's method, Fourth order Runge - Kutta method.</p>

UNIT-III (12Hrs)	Vectors and linear combinations: Vector space; Dimension; Basis, Orthogonal Projections; Gram-Schmidt Orthogonalization and QR decomposition.
UNIT-IV (12Hrs)	Linear transformations: vector space of L.T., properties of Linear operator, Rank and Nullity of L.T. Inner product spaces: Introduction, real and complex Inner Products, norm of vector, Normed vector spaces, Cauchy Schwarz's inequality, Distance in an inner product space.
UNIT-V (10Hrs)	Singular value decomposition and Principal component analysis; Introduction to their applications in Image Processing and Machine Learning.
Text Books:	
1.	Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers.
2.	Linear Algebra and Its Applications, David C. Lay, Steven R. Lay and Judi J. McDonald
3.	Linear Algebra and Optimization for Machine Learning, Charu C. Aggarwal, Springer publication
4.	Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 10 th Edition
Reference Books:	
1.	Advanced Engineering Mathematics, (Second Edition), Michael. D. Greenberg, Pearson.
2.	Advanced Engineering Mathematics, (Seventh Edition), Peter V. O'Neil, Cengage Learning.
3.	Linear Algebra, M. L. Kanna, Jai Prakash nath & Co, Meerut
4.	Applied Mathematics (Vol. I & II), P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan.
5.	Digital Image Processing, R C Gonzalez and R E Woods, Pearson.
6.	Linear Algebra and Optimization for Machine Learning, Charu C. Aggarwal, Springer Publication

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM2101	ES	3	--	--	3	30	70	3 Hrs.
MATHEMATICAL FOUNDATIONS FOR MACHINE LEARNING								
(For AIML)								
Course Objectives: Students are expected to								
1	Understand propositional and predicate calculus.							
2	Learn concepts of counting techniques.							
3	Identify various types of relations and discuss their properties.							
4	Learn a few algebraic structures.							
5	Know about generating functions and methods of solving recurrence relations.							
6	Understand topics of algebra and differential calculus of vectors.							
Course Outcomes: At the end of the course students will be able to								
S. No	Outcome							Knowledge Level
1	Write and verify the arguments for their validity using propositional and predicate logic.							K3
2	Observe different counting methods and apply in their fields of study.							K3
3	Identify various types of relations and utilize their properties.							K3
4	Verify whether a given algebraic structure is a group or not.							K3
5	Formulate and solve the recurrence relations.							K3
6	Determine the dot product and cross product of vectors. Determine the gradient of a scalar function, divergence and curl of a vector function.							K3
SYLLABUS								
UNIT-I (12 Hrs.)	Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well-formed Formulae, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises. Predicate Calculus: Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.							
UNIT-II (10 Hrs.)	Combinatorics: Basics of Counting, Permutations, Permutations with Repetitions, Circular Permutations, Restricted Permutations, Combinations, Restricted Combinations, Generating Functions of Permutations and Combinations, Binomial and Multinomial Theorems, Binomial and Multinomial Coefficients, Principles of Inclusion–Exclusion.							

UNIT-III (12 Hrs)	Relations & Algebraic structures: Review on set theory, Definition of Relation, Properties of Relations, Relation Matrix and Digraph, Operations on Relations, Transitive Closure, Equivalence and Compatibility relations. Binary operations, examples, algebraic systems- properties, semi groups, monoid, group, subgroup, abelian group
UNIT-IV (10 Hrs.)	Recurrence Relations: Generating Functions, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution, Generating Function and Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations.
UNIT-V (10 Hrs.)	Vector Analysis: Algebra of vectors: Definition, addition of vectors, dot product and cross product involving two and three vectors, geometrical and physical interpretation of product of two vectors. Vector calculus: Scalar point function, vector point function, vector differential operator ∇ , gradient of a scalar point function, directional derivative; divergence and curl of a vector point function, ∇ applied to product of two functions, ∇ applied twice to point functions.
Text Books:	
1.	Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
2.	Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P. Baker, 2 nd Edition, Prentice Hall of India.
3.	Higher Engineering Mathematics, B.S.Grewal, 43 rd Edition, Khanna Publishers.
Reference Books:	
1.	Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D.P. Mahopatra, 3 rd Edition, Tata McGraw Hill.
2.	Schaum's outline Series of Theory and problems of Vector Analysis and an introduction to Tensor Analysis. By Murray R. Spiegel. Mc Graw Hill Schaum's outline Series.
3.	Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7 th Edition, Tata McGraw Hill.
4.	Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby, Sharon Cutler Ross, PHI.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM2102	PC	3	0	0	3	30	70	3 Hrs.
OBJECT ORIENTED PROGRAMMING WITH JAVA								
(Common to AIML & CSG)								
Course Objectives:								
1.	To identify Java language components and how they work together in applications							
2.	To learn the fundamentals of object-oriented programming in Java, including defining classes, Invoking methods, using class libraries and collections.							
3.	To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling, file I/O in Java applications							
4.	To understand how to design applications with threads in Java.							
5.	To understand how to use Java JDBC APIs and SWING framework for program development.							
Course Outcomes: At the end of the course Students will be able to								
S. No	OUTCOME							Knowledge Level
1.	Demonstrate the syntax and semantics of java programming language and basic concepts of OOP.							K2
2.	Explain array data structure, collections and string manipulation operations							K2
3.	Use input & output streams for persistent storage of data and develop reusable programs using the concepts of inheritance, interfaces and packages							K3
4.	Apply the concept of Exception handling and multithreading to build an efficient and error free code.							K3
5.	Develop a GUI application using SWING and apply JDBC to interface with database.							K3
SYLLABUS								
UNIT-I (10Hrs)	Introduction to JAVA: Structure of JAVA, Features of JAVA, JAVA Tokens, Command Line Arguments, User input to programs, Data Types, Literals Constants, Variables, Operators, Type Casting, Control Statements.							
	Classes & Objects: Introduction, Class Declaration and Modifiers, Class Members, Methods, Defining methods, Declaration of Class Objects, Method overloading and Nested classes.							
	Constructors: Default Constructor, Parameterized Constructor, Copy Constructor and Constructor Overloading, Types of variables, Instance Variables, Static variables, Local Variables and This Keyword.							

UNIT-II (10 Hrs)	<p>Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Dynamic Change of Array Size, Two-dimensional Arrays and Three-dimensional Arrays.</p> <p>Collections: Introduction to Collections, ArrayList: add, remove and access elements, HashMap: add, remove, access and search and HashSet: add, remove, iterate, union, intersection, subset.</p> <p>String Handling in Java: Introduction, Methods in String Class, Methods for comparison of Strings, Methods for Modifying Strings, Methods for searching Strings, String Constant Pool and String Buffer class.</p>
UNIT-III (10Hrs)	<p>Inheritance: Introduction, Types of Inheritances, Single inheritance, Multi-level inheritance, Hierarchical Inheritance, Hybrid Inheritance and Multiple inheritance, Method Overriding, Super Keyword, Final Keyword and Abstract Classes.</p> <p>Interfaces and Packages: Introduction, Declaration of Interface, Implementing Interfaces, Extending interfaces, Interface Variables, Interface Variable Naming conflicts, Interface Methods, Interface Method Naming Conflicts and Adapter classes.</p> <p>Packages: Introduction, Defining Package, Importing Packages, Static import and Access Modifiers.</p> <p>File IO: Introduction, IO classes and interfaces, Stream classes, Byte Streams, the character streams</p>
UNIT-IV (10Hrs)	<p>Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Statements, Class Throwable, Custom Exceptions, Nested try and catch Blocks.</p> <p>Multithreaded Programming: Introduction, Need for Multiple Threads, Thread class, Thread Life Cycle, Extending Thread class, Implementing Runnable interface, Thread Priorities, Thread Synchronization and Inter-thread communication.</p>
UNIT-V (12 Hrs)	<p>GUI programming with Swing: Introduction, limitations of AWT, MVC Architecture, containers. Understanding Layout Managers: Flow, Border, Grid</p> <p>Event Handling: The Delegation event model-Events, Event sources, Event Listeners, Event classes, A Simple Swing Application.</p> <p>Exploring swing controls: JLabel, Jtextfield, The swing buttons-JButton, JToggle Button, JCheck Box, JRadio Button, JTabbed Pane, JScroll Pane, JList, JCombo Box, Swing Menus, Dialogs</p> <p>Java Database Connectivity: Introduction, Structure of JDBC, JDBC Architecture, Types of JDBC Drivers, JDBC API (java. sql package), Establishing JDBC Database Connections.</p>
Text Books:	
1.	Core Java Volume I--Fundamentals: 1 (Core Series)11 th edition (2020) by Cay Horstmann, Publisher: Pearson
2.	The complete Reference Java, 12th edition (2021), Herbert Schildt, Publisher: TMH.

3.	Jdbc Api Tutorial and Reference 3E(2003), by Maydene, Jon Ellis (Author), Jonathan Bruce, Publisher : Addison-Wesley Professional
Reference Books:	
1.	Introduction to java programming, 9th edition (2014) by Y Daniel Liang, Pubisher:Pearson
2.	Murach's Java Programming, 5 th edition (2017) Joel Murach , Pubisher: Mike <i>Murach</i>
3.	JAVA one step ahead, 1 st edition (2017) Anitha Seth, B.L.Juneja, Oxford.
4.	Java: A Beginner's Guide, Eighth Edition 8th Edition (2018)by Herbert Schildt, Pubisher:McGraw-Hill Education
5.	Head First Java 3e (2021)(A Brain Friendly Guide) by Kathy Sierra & Bert bates, Pubisher: O'Reilly
6.	Programming With Java: A Primer 6E (2019)By Balagurusamy, Pubisher:TMH.
e-Resources:	
1.	https://nptel.ac.in/courses/106/105/106105191/
2.	https://www.coursera.org/learn/java-introduction
3.	https://docs.oracle.com/javase/tutorial/
4.	https://www.linkedin.com/in/jamesgosling
5.	https://en.wikipedia.org/wiki/James_Gosling#Books



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM2103	PC	3	0	0	3	30	70	3 Hrs.

DATABASE MANAGEMENT SYSTEMS

(Common to AIML & CSG)

Course Objectives:

1.	To introduce about database management systems
2.	To give a good formal foundation on the relational model
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 and normalization
5.	To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques
6.	To explain Transaction management techniques

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

S.No	Course Outcome	Knowledge Level
1.	Describe fundamental concepts of a relational database	K2
2.	Create, maintain and manipulate a relational database using SQL	K3
3.	Apply Conceptual and Logical database design	K3
4.	Apply normalization for database design	K3
5.	Illustrate Storage management and Transaction management techniques.	K2

SYLLABUS

UNIT-I (8 Hrs)	Introduction: Database system, Database Vs File System, Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence, Three layer schema architecture for data independence, Database system structure, environment.
UNIT-II (10 Hrs)	Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion).
UNIT-III (10 Hrs)	Entity Relationship Model: Introduction, Basic features of ER model, Representation of entities, attributes, entity set, relationship, relationship set, types of relationships, ER diagrams Generalization/specialization and Aggregation. SQL: Creating tables with relationships, implementation of key and integrity constraints in SQL, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, views (updatable and non-updatable), relational set operations.

UNIT-IV (10 Hrs)	Schema Refinement (Normalization): Purpose of Normalization, concept of functional dependency, Closure of functional dependency and attribute closure, 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, Fourth normal form (4NF), Fifth Normal Form (5NF).
UNIT-V (10 Hrs)	Transaction Concepts: Transaction State, Implementation of Atomicity and Durability, Schedules, Serializability, Recoverability, Implementation of Isolation levels in SQL, 2PL protocol, Introduction to indexing, B+ Tree indexing and locking, and Time stamp ordering protocol, Failure Classification, Recovery and Atomicity, ARIES Recovery algorithm.
Text Books:	
1.	Database System Concepts by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 7th Edition, McGraw-Hill Education, 2019.
2.	Database Management Systems by Raghu Ramakrishnan, Johannes Gehrke, 3rd Edition., McGraw-Hill Education (India), 2014.
Reference Books:	
1.	Database Principles: Fundamentals of Design, Implementation, and Management by Steven Morris, Keeley Crockett, Carlos Coronel, Craig Blewett, Cengage, 2020.
2.	Fundamentals of Database Systems by Ramez Elmasri, Shamkant B. Navathe, 7th Edition, Pearson Education India, 2015.
3.	Introduction to Database Systems by C J Date, 8th Edition, Pearson Education, 2009.
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
B20AM2104	PC	3	0	0	3	30	70	3 Hrs.

INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

(For AIML)

Course Objectives: Students are expected

1	To provide a strong foundation of fundamental concepts in Artificial Intelligence.
2	To provide a basic exposition of the goals and methods of Artificial Intelligence.
3	To provide fundamentals of machine learning

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

S.No	Outcome	Knowledge Level
1	Summarize different AI problems, characteristics and state space representation	K2
2	Apply heuristic, uninformed and informed search strategies for solving AI problems	K3
3	Use different knowledge representational schemes on the given facts to infer new facts.	K3
4	Summarize different ML tasks, Applications and their importance	K2
5	Demonstrate concept learning and illustrate general to specific ordering of hypothesis space	K3

SYLLABUS

UNIT-I (10 Hrs)	Introduction to Artificial Intelligence: What is Artificial Intelligence, AI Problems, Agents in AI – what is agent, intelligent agents, rational agent, structure of an AI Agent, PEAS representation, Defining the Problem as a State Space Search-Water jug problem, 8-puzzle problem, Travelling Salesmen Problem, Turing Test, Problem Characteristics , Production Systems, Production System Characteristics.
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UNIT-II (12Hrs)	Uninformed search-BFS & DFS, Search Techniques: Heuristic Search Techniques: Generate-And- Test, Hill Climbing, Problem Reduction, AO*Algorithm, Constraint Satisfaction, Means-Ends Analysis. Local Search Algorithms (Hill Climbing, Steepest Ascent Hill Climbing, Simulated Annealing, Local beam search) and Optimization Problems (TSP) Informed Search algorithms-Best-First Search & A* Algorithm
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UNIT-III (12Hrs)	Knowledge Representation using Symbolic Logic: Propositional Logic, First Order Predicate Logic, WFF representation, conversion of WFF to Clause, Unification algorithm, Resolution algorithm in propositional logic, and Resolution algorithm in predicate logic Structured Representations of Knowledge: Semantic Nets, Partitioned Semantic Nets, Frames, Conceptual Dependency and Scripts.
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UNIT-IV (12Hrs)	Introduction to Machine Learning: Well-Posed Learning Problem, Designing a Learning system, Perspectives and Issues in Machine Learning. Machine Learning as an AI approach, Types of ML tasks: Data: Supervised, Unsupervised, Semi-supervised, Reinforcement; Output: Classification, Regression, Ranking; Model: Generative, Discriminative; Applications of Machine Learning
UNIT-V (10Hrs)	Concept Learning and The General-to-Specific Ordering: Introduction, A Concept Learning Task, Concept Learning as Search, FIND-S: Finding a Maximally Specific Hypothesis, Version Spaces and the Candidate Elimination Algorithm, Remarks on Version spaces and Candidate-Elimination, Inductive Bias
Text Books:	
1.	Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Pearson, 2015
2.	Artificial Intelligence, Elaine Rich and Kevin Knight, Tata McGraw-Hill Publications, 3 rd Edition, Year-2010
3.	Artificial Intelligence- Saroj Kaushik, CENGAGE Learning India, 2011
4.	Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge, 1 st Edition, 2012
5.	Tom M. Mitchell, Machine Learning, McGraw Hill Edition, 2013
Reference Books:	
1.	Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011
2.	Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill, 2017
3.	David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010.
4.	Trivedi, M.C., "A Classical Approach to Artificial Intelligence", Khanna Publishing House, Delhi, 2 nd Edition, 2018
5.	Christopher Bishop, Pattern Recognition and Machine Learning (PRML), Springer, 2007.
6.	Shai Shalev-Shwartz and Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms (UML), Cambridge University Press, 2014.
Web Resources:	
1.	https://nptel.ac.in/courses/106105077
2.	https://nptel.ac.in/courses/106106126
3.	https://nptel.ac.in/courses/106106126
4.	https://aima.cs.berkeley.edu
5.	https://ai.berkeley.edu/project_overview.html
6.	http://www.zuj.edu.jo/download/machine-learning-tom-mitchell-pdf/
7.	http://www.ntu.edu.sg/home/egbhuang/pdf/ieee-is-elm.pdf
8.	https://swayam.gov.in/nd1_noc20_cs73/preview

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM2105	PC	0	0	3	1.5	15	35	3 Hrs.
OBJECT ORIENTED PROGRAMMING WITH JAVA LAB								
(Common to AIML & CSG)								
Course Objectives:								
1.	Practice programming in the Java							
2.	Gain knowledge of object-oriented paradigm in the Java programming language							
3.	Learn use of Java in a variety of technologies and on different platforms							
Course Outcomes: At the end of the course, Students will be able to								
S.No	Outcome							Knowledge Level
1.	Develop simple programs using command line arguments, arrays, collections and strings.							K3
2.	Apply the concepts of Classes, Objects, Constructors, Methods and Runtime Polymorphism in solving fundamental problems.							K3
3.	Develop reusable programs using the concepts of inheritance, interfaces and packages.							K3
4.	Develop Applications using exception handling and multithreading.							K3
5.	Apply the concepts of Java IO Files and database in real time problem solving.							K3
SYLLABUS								
1.	Exercise - 1 (Basics) a) Write a JAVA program to read and display values of all primitive data types of JAVA. b) Write a JAVA program using Command line arguments							
2.	Exercise - 2 (Classes, Objects, Constructors) a) Write a JAVA program to implement Classes and Objects. b) Write a JAVA program implement method overloading. c) Write a JAVA program to implement Default Constructor. d) Write a JAVA program to implement Parameterized Constructor. e) Write a JAVA program to implement constructor overloading. f) Write a JAVA program to implement this keyword.							
3.	Exercise - 3 (Arrays, Collections, Strings) a) Write a JAVA program to search for an element in a given list of elements using linear search. b) Write a JAVA program to search for an element in a given list of elements using binary search. c) Write a JAVA program to sort for an element in a given list of elements using bubble sort. d) Write a JAVA program to sort for an element in a given list of elements using merge sort. e) Write a JAVA program to implement Matrix Multiplication. f) Write a JAVA program to implement ArrayList Operations. g) Write a JAVA program to implement HashMap Operations.							

	<ul style="list-style-type: none"> h) Write a JAVA program to implement String Operations. i) Write a JAVA program to implement StringBuffer class.
4.	<p>Exercise - 4(Inheritance)</p> <ul style="list-style-type: none"> a) Write a JAVA program to implement Single Inheritance. b) Write a JAVA program to implement multilevel Inheritance. c) Write a JAVA program to implement hierarchical Inheritance. d) Write a java program for abstract class to find areas of different shapes. e) Write a JAVA program to implement “super” keyword. f) Write a JAVA program to implement “final” Keyword.
5.	<p>Exercise - 5 (Interfaces, Packages)</p> <ul style="list-style-type: none"> a) Write a JAVA program to implement Interface. b) Write a JAVA program to create a user defined package called NUM having even and prime as methods. Then access those methods in another program to find given number are even or prime? c) Write a JAVA program to implement sub Packages.
6.	<p>Exercise - 6 (Exception Handling)</p> <ul style="list-style-type: none"> a) Write a JAVA program to implement the following Built in Exceptions. <ul style="list-style-type: none"> i) Arithmetic Exception. ii) Array Index Out Of Bounds Exception iii) Number Format Exception. iv) Null Pointer Exception. b) Write a JAVA program to implement multiple catch statements. c) Write a JAVA program to implement user defined Exception.
7.	<p>Exercise – 7 (Multithreading)</p> <ul style="list-style-type: none"> a) Write a JAVA program that creates threads by extending Thread class .First thread display “Good Morning “every 1 sec, the second thread displays “Hello “every 2 seconds and the third display “Welcome” every 3 seconds . b) Write a JAVA program to implement Runnable Interface. c) Write a program to implement priorities to Thread. d) Write a JAVA program to implement Thread Synchronization(Multiplication tables)
8.	<p>Exercise - 8 (File IO)</p> <ul style="list-style-type: none"> a) Write a JAVA program to copy contents of file into another using Byte Oriented IO. b) Write a JAVA program to copy contents of file into another using Character Oriented IO. c) Write a JAVA program to display contents of file using Line Oriented IO. d) Write a JAVA program to convert the values into tokens using Scanner class.
9.	<p>Exercise - 9 (JDBC)</p> <ul style="list-style-type: none"> a) Write a JDBC program to insert data into database. b) Write a JDBC program to delete data from database. c) Write a JDBC program to update data into database. d) Write a JDBC program to retrieve data from database.

Reference Books:	
1.	Core Java Volume I--Fundamentals: 1 (Core Series) 11 th Edition(2020) by Cay Horstmann, Publisher: Pearson
2.	The complete Reference Java, 12th edition (2021), Herbert Schildt, Publisher: MH.
3.	JdbcApi Tutorial and Reference 3 rd Edition(2003), by Maydene , Jon Ellis (Author), Jonathan Bruce, Publisher : Addison-Wesley Professional
4.	Introduction to java programming, 9th Edition(2014) by Y Daniel Liang, Publisher: Pearson
5.	Murach's Java Programming, 5 th Edition(2017) Joel Murach , Publisher: Mike <i>Murach</i>
6.	JAVA one step ahead, First Edition (2017) Anitha Seth, B.L.Juneja, Oxford.
7.	Programing With Java: A Primer 6 th Edition (2019) By Balagurusamy, Publisher: MH.
e-Resources:	
1.	https://nptel.ac.in/courses/106/105/106105191/
2.	https://www.coursera.org/learn/java-introduction
3.	https://docs.oracle.com/javase/tutorial/
4.	https://www.linkedin.com/in/jamesgosling
5.	https://en.wikipedia.org/wiki/James_Gosling#Books
6.	https://nptel.ac.in/courses/106/105/106105191/



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM2106	PC	0	0	3	1.5	15	35	3 Hrs.

DATABASE MANAGEMENT SYSTEMS LAB

(Common to AIML & CSG)

Course Objectives:

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: At the end of the course Students will be able

S.No	Outcome	Knowledge Level
1.	Apply DDL, DML and DCL commands of SQL	K3
2.	Build PL/SQL programs including stored procedures, functions, cursors and triggers.	K3
3.	Design a database application	K4

SYLLABUS

1	Creation, altering and dropping 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, NOT EXISTS, UNION, INTERSECT, 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	i. Create a 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) ii. Insert data into the 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, User 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.	Design a Database mini project

Reference Books:

1.	Oracle Database 10C: The Complete Reference by Byrla, McGraw Hill Education, 2017.
2.	SQL The Complete Reference by James Groff, Paul Weinberg, Andy Opperl, 3 rd Edition, McGraw Hill Education, 2017.
3.	SQL, PL/SQL by Ivan Bayross, 4th Revised Edition, 2020.



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM2107	PC	0	0	3	1.5	15	35	3 Hrs.

INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LAB

(For AIML)

Course Objectives: Students are expected to

1	Provide a strong foundation of fundamental concepts in Artificial Intelligence.
2	Provide a basic exposition to the goals and methods of Artificial Intelligence.
3	Apply the techniques in applications which involve perception, reasoning and learning.
4	Apply basic concept learning and machine learning techniques

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

S.No	Outcome	Knowledge Level
1	Apply the basic principles of AI in problem solving using LISP/PROLOG	K3
2	Apply different uninformed, informed, heuristic, optimization search strategies in LISP/PROLOG to solve AI problems	K3
3	Construct an Expert System using JESS/PROLOG	K3
4	Apply Find-S & candidate elimination algorithm on Hypothesis space	K3
5	Demonstrate with a program for finding correlation between attributes, and Develop Linear & Multiple linear regression models	K3

SYLLABUS

List of Experiments (Artificial Intelligence)

1.	Apply DFS for generating solution to water jug problem using LISP/PROLOG
2.	Apply BFS for tic-tac-toe 8-puzzle problem using LISP/PROLOG/Java
3.	Apply nearest neighbor heuristic approach for solving TSP using Java/LISP/Prolog
4.	Apply Simulated Annealing Algorithm to solve 8-puzzle problem using LISP/PROLOG
5.	Apply Simple Hill-climbing to solve 8-puzzle problem using LISP/PROLOG
6.	Apply Simple Hill-climbing to solve Monkey Banana problem using LISP/PROLOG
7.	Apply A* algorithm to solve 8-puzzle problem using LISP/PROLOG
8.	Apply constraint satisfaction algorithm to solve Crypta Arithmetic problem SEND+MORE=MONEY

List of Experiments (Machine Learning) Python Libraries required: Sklearn

Note: Standard datasets can be downloaded from UCI Machine Learning Repository

(<https://archive.ics.uci.edu/ml/datasets.php>)

1.	Apply 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.
2.	Apply the candidate elimination algorithm to output a description of the set of all hypotheses consistent with the training examples. (For a given set of training data examples stored in a .csv

	file)
3.	Write a Program to calculate correlation coefficient between every input feature and target feature
4.	Write a program to implement linear and multiple regression on 'mtcars' data set to estimate the value of 'mpg' variable, with best R2 and plot the original values in 'green' and predicted values in 'red'
5.	Write a program to demonstrate the working of Logistic Regression classifier. Use appropriate data set for Logistic Regression.

Text Books:

1.	Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Pearson, 2015
2.	Elaine Rich and Kevin Knight, Artificial Intelligence, Tata McGraw-Hill Publications, 3 rd Edition, Year-2010
3.	Saroj Kaushik, Artificial Intelligence, CENGAGE Learning India, 2011
4.	Chris Albon, "Machine Learning with Python Cookbook- Practical Solutions from Preprocessing to Deep Learning", O'REILLY Publisher, 2018



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM2108	SOC	1	0	2	2	0	50	3 Hrs.

Skill Oriented Course-I

WEB APPLICATION DEVELOPMENT LAB

(For AIML)

Course Objectives:

1. Understand the principles of creating an effective web page.
2. Understand elements of design with regard to the web
3. Learn the language of the web: HTML5 and CSS
4. To develop the skill in Creating dynamic web pages using javascript
5. To provide knowledge in developing a web application with database connectivity
6. To develop the skill in server-side programming using node.js, React.js

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

S.No	Outcome	Knowledge Level
1.	Create static web pages using HTML and CSS	K3
2.	Create dynamic web pages using JavaScript	K3
3.	Develop Single Page Applications using Node.js and ReactJS	K4
4.	Store the data in MySQL	K3
5.	Get acquainted with the latest web application development trends in the IT industry	K3

Estd. 1980

SYLLABUS

1. **Exercise-1**
Design Time Table using HTML Table tag.

2. **Exercise-2**
Design the following static web pages required for an online book store website:
 - a. HOMEPAGE:**
The static home page must contain three **areas**.
Top of the page: Logo and the college name and links to Homepage, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).
Left of the page: At least four links for navigation, which will display the catalogue of respective links.
For e.g.: When you click the link “**B.Tech.**” the catalogue for B.Tech. Books should be displayed in the Right frame.
Right of the page: The *pages to the links in the left area must be loaded here*. Initially this page contains description of the website.

Logo	Web Site Name			
Home	Login	Registration	Catologue	Cart
B.Tech M.Tech.	Description of the Web Site			

b. LOGINPAGE:





Logo	Web Site Name			
Home	Login	Registration	Catologue	Cart
B.Tech. M.Tech.	<p>Login: <input type="text" value="11a51f0003"/></p> <p>Password: <input type="password" value="*****"/></p> <p><input type="button" value="Submit"/> <input type="button" value="Reset"/></p>			

c. CATOLOGUE PAGE:

The catalogue page should contain the details of all the books available in the website in a table: The details should contain the following:

- Snapshot of Cover Page.
- Author Name.
- Publisher.
- Price.

a. Add to cart button.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
B.Tech. M.Tech.	   	<p>Book : XML Bible Author : Winston Publication : Wiely</p> <p>Book : AI Author : S,Russel Publication : Princeton hall</p> <p>Book : Java 2 Author : Watson Publication : BPB publications</p> <p>Book : HTML in 24 hours Author : Sam Peter Publication : Sam</p>	<p>\$ 40.5</p> <p>\$ 63</p> <p>\$ 35.5</p> <p>\$ 50</p>	<p><input type="button" value="Add to cart"/></p> <p><input type="button" value="Add to cart"/></p> <p><input type="button" value="Add to cart"/></p> <p><input type="button" value="Add to cart"/></p>

	<p>(d). REGISTRATIONPAGE:</p> <p>Create a “<i>registration form</i> “with the following fields</p> <p>1) Name (Text field) 2) Password (password field) 3) E-mailid (text field) 4) Phone number (text field) 5) Sex (radio button) 6)Date of birth(3selectboxes) Languages known (checkboxes–English, Telugu, Hindi, Tamil) Address (text area)</p>
3.	<p>Exercise – 3</p> <p>Design a web page using CSS (Cascading Style Sheets) which includes the following:</p> <ul style="list-style-type: none"> • Inline style sheets • Internal style sheets • External style sheets
4.	<p>Exercise–4</p> <p>Design a web page using various CSS Selectors</p>
5.	<p>Exercise-5</p> <p>Design a dynamic web page with validation using JavaScript.</p>
6.	<p>Exercise-6</p> <p>Design a HTML having a text box and four buttons Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate JavaScript function should be called to display</p> <ul style="list-style-type: none"> • Factorial of that number • Is it Armstrong Number or not • Fibonacci series up to that number • Prime numbers up to that number • Is it palindrome or not
7.	<p>Exercise–7</p> <p>Write JavaScript programs on Event Handling</p> <ul style="list-style-type: none"> • Change color of background when the user clicks on the button. • Display calendar for the month and year selected from combo box • On Mouse over event
8.	<p>Exercise-8</p> <p>Develop a Single Page Application using Node.js & React.js for any two of the following:</p> <ol style="list-style-type: none"> a. Online Book Shop b. Online Examination c. Online Ticket reservation d. Online library e. Online Banking f. Online job portal g. Online Auction <p>Note: Students are encouraged to propose innovative ideas in the field of E-commerce as projects.</p>

Reference Books:

1.	Web Technologies, Black Book, Kogent Learning Solutions Inc, Dreamtech Press, September 17, 2009
2.	Head First JavaScript Programming: A Brain-Friendly Guide, Eric Freeman, Elisabeth Robson, 1 st Edition March 2014
3.	Beginning JavaScript: The Ultimate Guide to Modern JavaScript Development, Russ Ferguson, Apress; 3rd ed. edition (May 2, 2019)
4.	Get Programming with Node.js, Jonathan Wexler, Manning; 1st edition (March 15, 2019)
5.	The Road to React: Your journey to master plain yet pragmatic React.js, Robin Wieruch, September 14, 2018



Code	Category	L	T	P	C	I.M	E.M	Exam
B20MC2103	MC	2	--	--	0	--	--	--

ENGLISH PROFICIENCY

(Common to CSE, ECE, IT, AIML & CSG)

Course Objectives: Students are expected to

1.	Communicate their ideas and views effectively
2.	Practice language skills and improve their language competency.
3.	Know and perform well in real life contexts
4.	Identify and examine their self-attributes which require improvement and motivation.
5.	Build confidence and overcome their inhibitions, stage fright, nervousness etc.,
6.	Improve their reading skills.

Course Outcomes: The students will be able to

S.No.	Outcome	Knowledge Level
1.	Improve speaking skills.	K3
2.	Enhance their listening capabilities	K3
3.	Learn and practice the skills of composition writing.	K3
4.	Enhance their reading and understanding of different texts.	K3
5.	Improve their communication both in formal and informal contexts.	K3
6.	Be confident in presentation skills.	K3

SYLLABUS

UNIT-I	Listening Skills Types of listening Hearing and Listening Listening as a receptive skill
UNIT-II	Speaking Skills Presentation skills Describing event/place/thing Extempor, Debate, Group Discussion
UNIT-III	Reading Skills Types of Reading (Intensive and Extensive reading, Skimming, Scanning), Reading/Summarizing News Paper Articles
UNIT-IV	Writing Skills Essay Writing (Argumentative, Analytical and Descriptive) E-Mail Writing Business Letters Resume Writing
UNIT-V	Integrated Language Skills Listening Skills for Speaking and Writing Reading Skills for Writing and Speaking

Reference Books:	
1.	Fundamentals of Technical Communication by Meenakshiraman, Sangeta Sharma of OUP, 2014
2.	English and Communication Skills for Students of Science and Engineering, by S.P. Dhanavel, Orient Blackswan Ltd. 2009
3.	Enriching Speaking and Writing Skills, Orient Blackswan Publishers, 2014
4.	The Oxford Guide to Writing and Speaking by John Seely OUP, 1998
5.	Effective Technical Communication by M.Ashraf Rizwi. Tata Mcgraw hill, 2005
6.	Six Weeks to Words of Power by Wilfred Funk. W.R.Goyal Publishers, 1990
Note: Internal Assessment is carried out throughout the semester.	





Estd:1980

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

Regulation: R20		II / 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
B20BS2201	Probability and Statistics	BS	3	3	0	0	30	70	100
B20AM2201	Computer Organization	PC	3	3	0	0	30	70	100
B20AM2202	Data Ware housing and Mining	PC	3	3	0	0	30	70	100
B20AM2203	Automata Theory and Compiler Design	PC	3	3	0	0	30	70	100
B20HS2201	Managerial Economics and Financial Accountancy	HS	3	3	0	0	30	70	100
B20CS2205	R Programming Lab	PC	1.5	0	0	3	15	35	50
B20AM2204	Data Mining using Python Lab	PC	1.5	0	0	3	15	35	50
B20AM2205	Mobile App Development with Kotlin	ES	1.5	0	0	3	15	35	50
B20AM2206	Natural Language Processing with Python	SOC	2	1	0	2	--	50	50
B20MC2202	Environmental Science	MC	0	2	0	0	--	--	--
TOTAL			21.5	18	0	11	195	505	700

Code	Category	L	T	P	C	I.M	E.M	Exam
B20BS2201	BS	3	--	--	3	30	70	3 Hrs.

PROBABILITY AND STATISTICS

(Common to AIDS, AIML & CSE)

Course Objectives: Students are expected to

1	Have an idea of data science and single and joint random variables.
2	Learn the concept of mathematical expectation, generating functions and their properties.
3	Fit a linear or nonlinear curve for a data using method of least squares.
4	Know about the correlation coefficient and regression lines.
5	Analyse various statistical measures of a few discrete and continuous probability distributions.
6	Develop a framework for testing of hypothesis in giving inferences about Population parameters.

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

S. No	Outcome	Knowledge Level
1	Understand the concepts of data science and identify a random variable as discrete/continuous and analyse it.	K3
2	Determine statistical measures like Mean, Variance and generating functions in terms of Expectations.	K3
3	Determine a best suitable curve for a given data using the method of least squares.	K3
4	Determine correlation coefficient and regression lines.	K3
5	Solve simple problems based on discrete and continuous probability distributions.	K3
6	Apply testing of hypothesis for getting inferences about Population Parameters based on Sample statistic.	K3

SYLLABUS

UNIT-I (12 Hrs.)	<p>Descriptive statistics and methods for data science: Data science, Statistics Introduction, Collection of data, primary and secondary data, Type of variables: dependent and independent, Categorical and Continuous variables, Data visualization, Measures of Central tendency, Measures of Variability (spread or variance), Moments, Measures of Skewness and Kurtosis.</p> <p>Random Variables and Probability functions: Definition of a random variable, Distribution function, Properties of Distribution Function, Discrete Random Variable, Probability Mass Function, Discrete Distribution Function, Continuous Random Variable, Probability Density Function, Continuous Distribution Function.</p>
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UNIT-II (10 Hrs.)	<p>Two-dimensional random variables: Joint probability mass function and density functions, two-dimensional distribution function, marginal functions, simple examples.</p> <p>Mathematical Expectation: Mathematical Expectation of a Random Variable, Expected Value of function of a Random Variable, Addition Theorem and Multiplication Theorem of Expectation (without proofs), Statistical Measures like Mean, Variance, Moments and Covariance in terms of Expectations.</p> <p>Generating functions: Moment generating Function, Characteristic Function of a Random Variable and cumulant generating function.</p>
UNIT-III (12 Hrs.)	<p>Curve fitting: Method of least Squares, fitting of a Straight line, Fitting of a Parabola, fitting of Exponential curves: $y = ae^{bx}$, $y = ab^x$ and Power curve: $y = ax^b$</p> <p>Correlation: Definition, Karl Pearson's Coefficient of Correlation, Limits for correlation coefficient, Rank Correlation, Spearman's formula for rank correlation coefficient (without proofs).</p> <p>Regression Analysis: Regression Lines, Regression Coefficients and their properties (without proofs).</p>
UNIT-IV (12 Hrs.)	<p>Discrete and Continuous Distributions:</p> <p>Discrete Distributions: Uniform distribution, Binomial distribution and Poisson distribution - Mean, Variance, moments, m.g.f., Characteristic function, Fitting of distributions.</p> <p>Continuous Distributions: Uniform distribution, Normal Distribution - Standard Normal Variate, Mean, Variance, m.g.f., Characteristic function, cumulant generating function.</p>
UNIT-V (12 Hrs.)	<p>Sampling theory and Testing of Hypothesis:</p> <p>Sampling Theory: Sample, population, statistic, parameter, Sampling distribution of a statistic, standard error, point and interval estimation. Testing of Hypothesis- Formulation of Null hypothesis, Alternative hypothesis, Critical region, level of significance, Errors in sampling- Type-I-error, Type-II-error, One-tailed and Two-tailed tests. Degrees of freedom.</p> <p>Large Sample Theory: Test of significance for single proportion and difference of proportions.</p> <p>Small Sample Theory: Student's-t-distribution: definition, t-test for single mean, t-test for difference of means, Paired t-test for difference of means.</p> <p>F-distribution: definition, F-test for equality of two population variances.</p> <p>Chi-square distribution: definition, Chi-square test for goodness of fit.</p>
TEXT BOOKS:	
1.	Probability, Statistics and Random Processes by T.Veerarajan, Tata Mc Graw Hill Pub.
2.	Fundamentals of Mathematical Statistics by S. C. Gupta and V.K. Kapoor, Sultan Chand & Sons Publishers.
REFERENCE BOOKS:	
1.	Higher Engineering Mathematics, by Dr.B.S.Grewal, 43 rd Edition, Khanna Publishers.

2.	Probability and statistics for Engineers, Miller and Freund, 7 th edition, Prentice-Hall India.
3.	Probability and statistics for Engineers and Scientists by Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, Eighth edition, Pearson Education.
4.	Michael Baron, Probability and statistics for computer scientists(1 st edn.), Chapman and Hall Book, 2003.
5.	Paul L. Meyer, Introductory Probability and Statistical Applications (2 nd edn.), Addison-Wesley, 1970.
WEB REFERENCE	
1.	http://www.swayam.gov.in



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM2201	PC	3	-	-	3	30	70	3Hrs
COMPUTER ORGANIZATION								
(Common to AIML & CSG)								
Course Objectives:								
1.	Learn basic building blocks of a computer and their organization.							
2.	Design a basic computer.							
Course Outcomes: At the end of the Course the students will be able to								
S.No	Outcome							Knowledge Level
1.	Understand basic building blocks of a computer and algorithms on arithmetic operations.							K2
2.	Develop computer functional blocks							K3
3.	Identify Regular operation of a computer							K2
4.	Understand Memory Hierarchy & I/O Organization.							K2
5.	Identify the parameters that enhance system performance							K2
SYLLABUS								
UNIT-I (10 Hrs)	Digital Computers and Arithmetic Historical perspective and von Neumann computers, Fixed and floating-point representation of numbers, Addition and Subtraction, Multiplication and Division algorithms, Floating- point arithmetic operations.							
UNIT-II (10 Hrs)	Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input Output and Interrupt, Complete Computer Description, Design of Basic Computer. Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit							
UNIT-III (10 Hrs)	Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC)							
UNIT-IV (10 Hrs)	Memory and I/O Organization Memory Hierarchy, Associative Memory, Cache Memory, Virtual memory.							

	I/O Organization: Peripheral devices, I/O interface, Asynchronous data transfer, Modes of transfer, Priority interrupt, direct memory access and IOP
UNIT-V (10 Hrs)	Pipeline and Vector Processing, Parallel Processing, Pipelining, Arithmetic and Instruction Pipelines, RISK Pipeline, Vector Processing, Array Processors, Multiprocessors, Interconnection structures, Cache coherence.
Text Books:	
1	Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., Third Edition, Sept.2008.
Reference Books:	
1.	Computer Organization and Architecture-Designing for Performance, William Stallings, Pearson,9th ed.,2013
2.	Essentials of Computer Organization and Architecture, Linda Null, JuliaLobur, Narosa Pub., 3rded.,2003,
3.	Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Zvonko Vranesic, 5 th ed., TMH, 2011.



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM2202	PC	3	0	0	3	30	70	3 Hrs.

DATA WARE HOUSING AND MINING

(For AIML)

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

S.No	Outcome	Knowledge Level
1.	Summarize the concepts of multidimensional data model and architecture of data warehouse	K2
2.	Identify the importance and applications of data mining, interpret data and apply different preprocessing methods, Similarity and, Dissimilarity measures on any given raw data.	K3
3.	Demonstrate and Apply Apriori and FP-growth association rule mining algorithms for frequent itemset generation	K3
4.	Construct a decision tree, Naïve Bayes Model, KNN Model and resolve the problem of model overfitting	K3
5.	Illustrate and Apply a suitable clustering algorithm for the given data set	K3

SYLLABUS

UNIT-I (8 Hrs)	An Overview: Data Warehouse: Basic Concepts, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Design and Usage, Data Warehouse Implementation. (Han & Kamber)
UNIT-II (12 Hrs)	Data Mining: Introduction, What is 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 (8 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-IV (10 Hrs)	<p>Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Algorithm, Attribute Selection Measures, Rule Based Classification, KNN (Han & Kamber)</p> <p>Model Overfitting: Due to the 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)</p>
UNIT-V (10 Hrs)	<p>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)</p>
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, McGraw Hill Education, 2017
4.	Data Mining Techniques, Arun K Pujari, Universities Press, 2001
e-Resources:	
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
B20AM2203	PC	3	--	--	3	30	70	3 Hrs.
AUTOMATA THEORY AND COMPILER DESIGN								
(For AIML)								
Course Objectives:								
1.	To learn design of Automata's as Acceptors.							
2.	To learn fundamentals of Regular and Context Free Grammars and Languages							
3.	To study the various phases in the design of a compiler							
4.	To study the design of top-down, bottom-up parsers							
5.	To learn to develop algorithms for code optimization and machine code for a target machine.							
Course Outcomes: By the end of the course students will be able to								
S.No	Outcome							Knowledge Level
1	Construction of DFA, NFA, NFA with ϵ -Transitions and output generating machines, regular expressions							K3
2	Construct Regular grammars and CFG, derive strings.							K3
3	Demonstrate the different phases of compilation process.							K3
4	Construct LR parsers for CFG and summarize Syntax directed translation schemes, intermediated code							K3
5	Demonstrate different code optimization techniques code generation techniques							K3
SYLLABUS								
UNIT-I (10 Hrs)	Finite Automata and Regular expressions Introduction to DFA and NFA, Acceptance of a Strings by DFA, Acceptance of a Strings by NFA, Design of DFAs, Design of NFAs, Conversion of NFA to DFA (Theorem and problems) Introduction to NFA with ϵ -Transitions, Conversion of NFA with ϵ -Transitions to DFA, Minimization of DFA algorithm and state minimization of DFA problems, Design of Mealy and Moore machines, Applications and Limitations of Finite Automata. Introduction to Regular Expressions, Regular Sets, Identity Rules, Conversion of Regular Expression to NFA with ϵ -Transitions, Applications of Regular Expressions.							
UNIT-II (10 Hrs)	Grammars and Formal languages Chomsky Hierarchy, Regular Grammar, Left-Linear Grammar, Right-Linear Grammar, Conversion of Finite Automata to Regular Grammars and Regular Grammars to Finite Automata, Context Free Grammar, Construction of CFGs for Languages, Determining language of the grammar. Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Elimination of left recursion and left factoring, Pumping Lemma of Regular Languages (Statement and problems), Applications of pumping lemma, Closure Properties of regular languages, Pumping Lemma for CFL (Statement and Problems),							

	Applications of pumping lemma for CFL, Closure Properties of CFL, Applications of Context Free Grammars.
UNIT-III (10 Hrs)	<p>Lexical analysis and Syntax analysis: Introduction to Language Processing, Structure of a Compiler, Compiler-Construction Tools.</p> <p>Lexical Analysis: The Role of Lexical Analysis, Specification of Tokens, Recognitions of Tokens, The Lexical Analyzer Generator LEX.</p> <p>Syntax Analysis: The Role of a Parser, Top down and Bottom-up Parsing, Shift Reduce Parser. Predictive Parser.</p>
UNIT-IV (10 Hrs)	<p>Powerful parsers and Intermediate code: Simple LR Parser, Canonical LR parser and LALR Parser, The Parser Generator YACC.</p> <p>Syntax-Directed Translation: Syntax Directed Definitions Inherited and Synthesized Attributes, Evaluating an SDD at Nodes of Parse Tree.</p> <p>Intermediate Code Generation: Three-Address Code, Quadruples, Triples, DAG, Type Checking (Rules for Type Checking and Type Conversion).</p>
UNIT-V (10 Hrs)	<p>Code Optimization and Code Generation: Code Optimization: The Principal Sources of Optimization, Introduction to Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Dead code elimination, constant propagation, Global Data-Flow Analysis.</p> <p>Code Generation: A Simple Code Generator, Code Generation from DAG, Peephole Optimization, Symbol Table and error detection in different phases. Storage Organization, Stack Allocation of Space.</p>
Text Books:	
1.	Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3 rd Edition, Pearson, 2008
2.	Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3 rd Edition, PHI, 2007
3.	Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Pearson, Pearson Education India; 2nd edition, 2013
4.	Compiler Construction- Principles and Practice, Kenneth C Loudon, Cengage Learning, 1 st Jan, 2009
Reference Books:	
1.	Elements of Theory of Computation, Lewis H.P. & Papadimition C.H., Pearson /PHI, 2 nd Edition, 2006
2.	Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press, 1998
Web Resources:	
1.	https://nptel.ac.in/courses/106/104/106104028/
2.	https://nptel.ac.in/courses/106/104/106104123/

Code	Category	L	T	P	C	I.M	E.M	Exam
B20HS2201	HS	3	0	0	3	30	70	3 Hrs.
MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY								
(Common to AIML, CSE & IT)								
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 for a product.							K2
2.	Have knowledge of Cost and its types and ability to calculate BEP							K3
3.	Understand the nature of different markets and Pricing Practices Prevailing in the today's business world							K2
4.	Prepare Financial Statements and know how to calculate Profit & Loss for a firm							K3
5.	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 Opportunity cost, Fixed cost Vs Variable cost, Explicit Vs Implicit cost, Historical cost Vs Replacement cost, 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.
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', Cengage Publications, 2012
Reference Books:	
1.	Dr.B.Kuberudu & T.V. Ramana : Managerial Economics and Financial analysis, 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
B20CS2205	PC	0	0	3	1.5	15	35	3 Hrs.

R PROGRAMMING LAB

(Common to AIML & CSE)

Course Objectives:

1.	In this course student will learn about the fundamentals of R programming, standard R libraries, solid understanding of R functions, write programs using the R and gain skills in R programming Language, get acquaintances with Arrays, Files, Strings, Packages, and distributions using R
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Course Outcomes: At the end of the course Students will be able to:

S.No	Outcome	Knowledge Level
1.	Implement basic concepts of R programming, and its different modules that includes conditional, looping, lists, Strings, Functions, Frames, Arrays, and File programming.	K3
2.	Implement the concepts of R Script to extract the data from data frames and file operations.	K3
3.	Implement the various statistical techniques using R.	K3
4.	Extend the functionality of R by using add-on packages.	K3
5.	Use R Graphics and Tables to visualize results of various statistical operations on data.	K4

SYLLABUS

1.	Exercise - 1 a. Installing R and RStudio b. Basic functionality of R, variable, data types in R
2.	Exercise - 2 a. Implement R script to show the usage of various operators available in R language. b. Implement R script to read person's age from keyboard and display whether he is eligible for voting or not. c. Implement R script to find biggest number between two numbers. d. Implement R script to check the given year is leap year or not.
3.	Exercise – 3 a. Implement R Script to create a list. b. Implement R Script to access elements in the list. c. Implement R Script to merge two or more lists. Implement R Script to perform matrix operation

4.	<p>Exercise-4</p> <p>Implement R script to perform following operations:</p> <ol style="list-style-type: none"> various operations on vectors Finding the sum and average of given numbers using arrays. To display elements of list in reverse order. Finding the minimum and maximum elements in the array.
5.	<p>Exercise-5</p> <ol style="list-style-type: none"> Implement R Script to perform various operations on matrices Implement R Script to extract the data from dataframes. Write R script to display file contents. Write R script to copy file contents from one file to another
6.	<p>Exercise-6</p> <ol style="list-style-type: none"> Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcars& cars datasets. Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset
7.	<p>Exercise-7</p> <ol style="list-style-type: none"> Reading different types of data sets (.txt, .csv) from Web or disk and writing in file in specific disk location. Reading Excel data sheet in R. Reading XML dataset in R
8.	<p>Exercise-8</p> <ol style="list-style-type: none"> Implement R Script to create a Pie chart, Bar Chart, scatter plot and Histogram (Introduction to ggplot0 graphics) Implement R Script to perform mean, median, mode, range, summary, variance, standard deviation operations
9.	<p>Exercise-9</p> <ol style="list-style-type: none"> Implement R Script to perform Normal, Binomial distributions. Implement R Script to perform correlation, Linear and multiple regression
10.	<p>Exercise-10</p> <p>Introduction to Non-Tabular Data Types: Time series, spatial data, Network data. Data Transformations: Converting Numeric Variables into Factors, Date Operations, String Parsing, Geocoding</p>
11.	<p>Exercise-11</p> <p>Introduction Dirty data problems: Missing values, data manipulation, duplicates, forms of data dates, outliers, spelling</p>

12.	Exercise–12 Data sources: SQLite examples for relational databases, Loading SPSS and SAS files, Reading from Google Spreadsheets, API and web scraping examples
Reference Books:	
1.	R Cookbook Paperback – 2011 by Teetor Paul O Reilly Publications
2.	Beginning R: The Statistical Programming Language by Dr. Mark Gardener, Wiley Publications,2013
3.	R Programming For Dummies by JorisMeysAndrie de Vries, Wiley Publications,2nd Edition,2016
4.	Hands-On Programming with R by Grolemund, O Reilly Publications,2014
5.	Statistical Programming in R by KG Srinivas G.M. Siddesh, Chetan Shetty & Sowmya B.J. - 2017 edition
6.	R Fundamentals and Programming Techniques, Thomas Lumely,2006
7.	R for Everyone Advanced Analytics and Graphics, Jared P. Lander- Addison Wesley Series,Pearson Education India,2014.
8.	The Art of R Programming, Norman Matloff, Cengage Learning,2011
9.	Maria Dolores Ugarte, Ana F.Militino, AlanT.Arnholt—Probability and Statistics with R, 2nd Edition, CRC Press, 2016.
10.	R-programming for Data science, Roger D.Peng, 2015.
11.	An Introduction to statistical learning-with applications in R, Trevor Hastie and Rob Tibshirani, Springer,2017
e-Resources:	
1.	URL: https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf (Online Resources)
2.	http://nptel.ac.in/courses/106104135/48
3.	http://nptel.ac.in/courses/110106064/
Software Requirements:	
1.	The R statistical software program. Available from: https://www.r-project.org/
2.	RStudio an Integrated Development Environment (IDE) for R. Available from: https://www.rstudio.com/

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM2204	PC	0	0	3	1.5	15	35	3 Hrs.

DATA MINING USING PYTHON LAB

(For AIML)

Pre-requisites: Python Programming, Python Programming Lab

Course Objectives: Students are expected to

1. Have practical exposure on implementation of well-known data mining algorithms
2. Learn performance evaluation of data mining algorithms in a supervised and an unsupervised setting.

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

S.No	Outcome	Knowledge Level
1.	Interpret data and Apply preprocessing techniques on real world datasets	K3
2.	Apply apriori algorithm to generate frequent item sets.	K3
3.	Build and evaluate Classification and Clustering algorithms on different datasets.	K5

SYLLABUS

1.	<p>Exercise-1 Demonstrate the following data preprocessing tasks using python libraries.</p> <ul style="list-style-type: none"> Loading the dataset Identifying the dependent and independent variables Dealing with missing data
2.	<p>Exercise-2 Demonstrate the following data preprocessing tasks using python libraries.</p> <ul style="list-style-type: none"> Dealing with categorical data Scaling the features Splitting dataset into Training and Testing Sets
3.	<p>Exercise-3 Demonstrate the following Similarity and Dissimilarity Measures using python</p> <ul style="list-style-type: none"> Pearson's Correlation Cosine Similarity Jaccard Similarity Euclidean Distance Manhattan Distance
4.	<p>Exercise-4 Build a model using linear regression algorithm on any dataset.</p>
5.	<p>Exercise-5 Build a classification model using Decision Tree algorithm on iris dataset Evaluate the above model using K-fold cross-validation</p>
6.	<p>Exercise-6</p>

	Apply Naïve Bayes Classification algorithm on any dataset Apply KNN algorithm on any dataset
7.	Exercise-7 Generate frequent itemsets using Apriori Algorithm in python and also generate association rules for any market basket data
8.	Exercise-8 Apply K- Means clustering algorithm on any dataset
9.	Exercise-9 Apply Hierarchical Clustering algorithm on any dataset
10.	Exercise-10 Apply DBSCAN clustering algorithm on any dataset.
Reference Books:	
1.	Learning Data Mining with Python, Robert Layton, Packt Publishing, Second Edition, 2017
e-Resources:	
1.	https://analyticsindiamag.com/data-pre-processing-in-python/
2.	https://towardsdatascience.com/decision-tree-in-python-b433ae57fb93
3.	https://towardsdatascience.com/calculate-similarity-the-most-relevant-metrics-in-a-nutshell-9a43564f533e
4.	https://www.springboard.com/blog/data-mining-python-tutorial/
5.	https://medium.com/analytics-vidhya/association-analysis-in-python-2b955d0180c
6.	https://www.datacamp.com/community/tutorials/naive-bayes-scikit-learn
7.	https://www.analyticsvidhya.com/blog/2019/05/beginners-guide-hierarchical-clustering/
8.	https://towardsdatascience.com/dbscan-algorithm-complete-guide-and-application-with-python-scikit-learn-d690cbae4c5d

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM2205	ES	--	--	3	1.5	15	35	3 Hrs.

MOBILE APP DEVELOPMENT with Kotlin

(For AIML)

Course Objectives: Students are expected to learn

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

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

S. No.	Outcome	Knowledge Level
1	Identify various concepts of mobile programming that make it unique from programming for other platforms	K3
2	Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.	K3
3	Program mobile applications for the Android operating system that use basic and advanced phone features	K3
4	Deploy applications to the Android marketplace for distribution	K6

SYLLABUS

LIST OF EXPERIMENTS

1.	Introduction to mobile technologies and devices, Android platform and applications overview
2.	Setting Android development environments
3.	Writing Android applications, Understanding anatomy of an Android application
4.	Develop an application that uses GUI components, Font and Colours.
5.	Develop an application that uses Layout Managers and event listeners.
6.	Write an application that draws basic graphical primitives on the screen.
7.	Create a quadrant in app and insert different objects.
8.	Create an app that displays multiple images in a page in vertical order
9.	Create an app that has multiple surfaces
10.	Develop a native application that uses GPS location information
11.	Implement login activity page
12.	Implement an application that creates an alert upon receiving a message
13.	Write a mobile application that makes use of RSS feed

14.	Create an app to calculate simple math operations (Hint: Use Kotlin functions to check if a given number is prime or not)
15.	Develop a Mobile application for simple needs (Mini Project)

Reference books:

1.	Neil Smyth, “Kotlin / Android Studio 3.0 Development Essentials”, Android 8 Edition, 2017
2.	Antonio Leiva, “Kotlin for Android Developers Learn Kotlin the easy way while developing an Android App”, 2016
3.	Dmitry Jemerov, Svetlana Isakova, “Kotlin in Action”, 1 st edition, Manning Publishers, 2017
4.	Bryan Sills, Brian Gardner, Kristin Marsicano and Chris Stewart, “Android Programming: The Big Nerd Ranch Guide, 5 th edition, 2022

e-Resources:

1.	Android App Development using Kotlin - https://www.udemy.com/course/android-app-development-using-kotlin/
2.	Android Development Courses on Google developers training https://developer.android.com/
3.	Android app using Kotlin - https://onlinecourses.swayam2.ac.in/aic20_sp02/preview
4.	Kotlin for Android - https://kotlinlang.org/docs/android-overview.html



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM2206	SOC	2	0	2	2	--	50	3 Hrs.

NATURAL LANGUAGE PROCESSING WITH PYTHON
(Skill Oriented Course- II)

(For AIML)

Course Objectives: Students are expected to learn

1. The main objective of the course is to understand the various concepts of natural language processing along with their implementation using Python

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

S. No	Outcome	Knowledge Level
1.	Explore natural language processing (NLP) libraries in Python	K3
2.	Learn various techniques for implementing NLP including parsing & text processing	K3
3.	Use NLP for text feature engineering, text classification	K3

LIST OF PROGRAMS

Python Libraries: nltk, re, word2vec

1.	Exercise-1 Demonstrate Noise Removal for any textual data and remove regular expression pattern such as hashtag from textual data
2.	Exercise-2 Perform lemmatization and stemming using python library nltk
3.	Exercise-3 Demonstrate object standardization such as replacing social media slangs from a text
4.	Exercise-4 Perform the part of speech tagging on any textual data.
5.	Exercise-5 Implement topic modeling using Latent Dirichlet Allocation (LDA) in python.
6.	Exercise-6 Demonstrate Term Frequency – Inverse Document Frequency (TF – IDF) using python Demonstrate word embeddings using word2vec
7.	Exercise-7 Implement Text classification using naïve bayes classifier and text blob library
8.	Exercise - 8 Apply support vector machine for text classification
9.	Exercise-9 Convert text to vectors (using term frequency) and apply cosine similarity to provide closeness among two text.
10.	Exercise-10 Case study 1: Identify the sentiment of tweets In this problem, you are provided with tweet data to predict sentiment on electronic products of

	netizens
11.	<p>Exercise – 11Case study 2: Detect hate speech in tweets.</p> <p>The objective of this task is to detect hate speech in tweets. For the sake of simplicity, we say a tweet contains hate speech if it has a racist or sexist sentiment associated with it.</p> <p>So, the task is to classify racist or sexist tweets from other tweets.</p>
Reference Books:	
1.	Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit, Steven Bird, Ewan Klein, Edward Loper, Oreilly Publishers, 1st Edition, 2009
e-Resources:	
1.	https://www.analyticsvidhya.com/blog/2017/01/ultimate-guide-to-understand-implement-natural-language-processing-codes-in-python/
2.	https://datahack.analyticsvidhya.com/contest/linguipedia-codefest-natural-language-processing-1/?utm_source=ultimate-guide-to-understand-implement-natural-language-processing-codes-in-python&utm_medium=blog
3.	https://www.analyticsvidhya.com/blog/2018/07/hands-on-sentiment-analysis-dataset-python/



Code	Category	L	T	P	C	I.M	E.M	Exam
B20MC2202	MC	2	--	--	--	30	70	3 hrs.

ENVIRONMENTAL SCIENCE

(For AIML & CSG)

Course Objectives: The objectives of the course are to impart:

1.	Overall understanding of the natural resources.
2.	Basic understanding of the ecosystem and its diversity.
3.	Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
4.	An understanding of the environmental impact of developmental activities.
5.	Awareness on the social issues, environmental legislation and global treaties.

Course outcomes: After completion of the course, students will be able to

S. No	Outcome	Knowledge Level
1	Classify different natural ecosystems	K2
2	Utilize natural resources for sustainable nature	K2
3	Understand the significance of biodiversity	K2
4	Illustrate resource pollution and control measures at global level	K2
5	Outline the salient features of constitutional provisions for environmental protection	K2

SYLLABUS

UNIT-I (8 Hrs)	<p>Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects;. Role of information technology in environment and human health.</p> <p>Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.</p>
UNIT-II (8 Hrs)	<p>Natural Resources: Natural resources and associated problems.</p> <p>Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.</p> <p>Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.</p> <p>Mineral resources: Use and exploitation, environmental effects of extracting and using</p>

	<p>mineral resources.</p> <p>Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.</p> <p>Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.</p> <p>Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.</p>
UNIT-III (8 Hrs)	<p>Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.</p>
UNIT-IV (8 Hrs)	<p>Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.</p> <p>Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.</p>
UNIT-V (8 Hrs)	<p>Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Sustainability: theory and practice, Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation.-Public awareness.</p>
UNIT-VI (8 Hrs)	<p>Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics. Environmental dairy.</p> <p>The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.</p>
Text Books:	
1.	Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada Rani; Pearson Education, Chennai

2.	Environmental Studies, R. Rajagopalan, 2 nd Edition, 2011, Oxford University Press.
3.	Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula
Reference Books:	
1.	Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2.	A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3.	Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4.	Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

