ACHARYANAGARJUNAUNIVERSITY
SCHEME OF INSTRUCTION AND EXAMINATION
w.e.f. 2022-2023 R20 Syllabus
ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (AI&ML)
II/IVB.TECH-SEMESTER I

S.No	Course Details		Category	Scheme of Instruction			SchemeofExamination		
	Code	SubjectName		HoursinaWeek			Marks		
				L	T	P	Internal	External	Credits
1	AM 211	Probability&Statistics	BS	4	1	0	30	70	3
2	AM 212	Analog &DigitalElectronics	PC	4	1	0	30	70	3
3	AM213	OperatingSystems	PC	4	1	0	30	70	3
4	AM214	Data structures Using C	PC	4	1	0	30	70	3
5	AM215	Software Engineering	PC	4	1	0	30	70	3
6	AM216	Value Ethics and Gender Culture	MC	3	1	0	30	70	2
7	AM251	ADELab	PC	0	0	3	30	70	1.5
8	AM252	UNIX/OS Lab	PC	0	0	3	30	70	1.5
9	AM253	DS Lab	PC	0	0	3	30	70	1.5
10	AM254	Scripting Language Lab	Skill	1	0	2	30	70	2
TotalCredits									**23.5**

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II/IVB.TECH-SEMESTER II

S.No	CourseDetails		Category	Scheme of Instruction			SchemeofExamination		
	Code	SubjectName		Hoursin aWeek			Marks		
				L	T	P	Internal	External	Credits
1	CSE/AM 221	DMS	BS	4	1	0	30	70	3
2	CSE/AM 222	COA	PC	4	1	0	30	70	3
3	AM223	JAVA Programming	PC	4	1	0	30	70	3
4	AM224	AI	PC	4	1	0	30	70	3
5	AM225	DAA	PC	4	1	0	30	70	3
6	AM261	JAVA Lab	PC	0	0	3	30	70	1.5
7	AM262	AI Lab	PC	0	0	3	30	70	1.5
8	AM263	Communicative English Lab II	HS	0	0	3	30	70	1.5
9	AM264	Advanced Python Programming Lab	Skill	1	0	2	30	70	2
TotalCredits									**21.5**
Internship 2 months (Mandatory) during Summer vacation									
Honors/Minor Courses (The hours distribution can be 3-0-2 or 3-1-0 also)									**4**

AM211	Probability&Statistics

Course Objectives:

• To familiarize the students with the foundations of probability and statistical methods

• To impart probability concepts & statistical methods in various applications engineering

UNITI: Descriptive statistics

Statistics Introduction, Population vs Sample, Measures of Central tendency, Measures of Variability (spread or variance) , Skewness and Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, principle of least squares, method of least squares, regression lines.

UNIT II: Probability

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Bayes' theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

UNIT III: Probability distributions

Probability and Distributions: Probability– Conditional probability and Bayes' theorem – Randomvariables – Discrete and Continuous random variables – Distribution function – MathematicalExpectation and Variance – Binomial, Poisson, Uniform, Normal and exponential distributions.

UNIT IV: Estimation and Testing of hypothesis, large sample tests

Estimation - parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test.

Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems.

UNITV: Small sample tests

Student t- distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

Reference Books:

1. Miller and Freunds, Probability and Statistics for Engineers, 7/e, Pearson, 2008.

2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

3. S. Ross, a First Course in Probability, Pearson Education India, 2002.

4. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.

5. Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8thEdition, Pearson 2007.

6. Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.

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

● Classify the concepts of data science and its importance

● Interpret the association of characteristics & through correlation & regression tools

 ● Make use of the concepts of probability and their applications

 ● Apply discrete and continuous probability distributions

 ● Design the components of a classical hypothesis test

 ● Infer the statistical inferential methods based on small and large sampling tests

AM212	Analog&DigitalElectronics

CourseObjectives/StudentLearningOutcomes:

Thestudentscompletingthiscoursewill understand:

- Basic Analog and digital electronics, including comparing the merits and demerits ofthedifferentamplifiers and ableto bias thetransistors accordingly.
- Transistorcharacteristics,operationalamplifiers.
- The student must be able to convert from one number system to another, work

  outproblemsrelatedtoBooleanalgebra,minimisationproblemsetc.,logicgates,combinationalandsequentiallogicandAnalog-to-digitaldigital-to-Analogconversiontechniques.
- Finally, students will gain experience in with the design of Analog amplifiers, powersupplies and logicdevices.

UNIT-I: BJT: Bipolar Junction transistor, BJT characteristics Transistor as an amplifier,CE/CS, CB/CG, CC/CD Configurationsandtheirfeatures. Biasing Schemes forBJTandFETamplifiers, Biasstability,

Amplifier models: Voltage amplifier, Current amplifier, Trans-conductance amplifier andTrans-resistanceamplifier.

Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift,Wien-bridgeetc.),LCoscillators (Hartley,Colpitt,Clappetc.),non-sinusoidaloscillators.

UNIT-II: Differential amplifier: Basic structure and principle of operation, calculation

ofdifferentialgain,commonmodegain,CMRRandICMR.OPAMPdesign:designofdifferentialamplifierforagivenspecification,designofgainstagesandoutputstages,compensation.OP-AMPapplications:reviewofinvertingandnon-invertingamplifiers,integratorand differentiator, summing amplifier.

UNIT-III:Fundamentals ofDigitalSystems :

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations,Booleanalgebra,examplesofICgates.Numbersystems:binary,signedbinaryo

ctal,hexadecimal number, binary arithmetic, one'sandtwo'scomplements arithmetic, codes,errordetectingandcorrecting codes.

UNIT-IV:CombinationalCircuits:

Standard representation for logic functions, K-map representation, simplification oflogicfunctionsusingK-map,minimizationoflogicalfunctions.Don'tcareconditions,QuineMcCluskeymethod of function realization.Multiplexer, De-Multiplexer/Decoders, Adders,Subtractors,BCDarithmetic,carrylookaheadadder,serialadder,

UNIT-V:SequentialCircuits

A 1-bit memory, the circuit properties of Bi-stable latch, the clocked SR flip flop, J-K-T andD types flip-flops, applications of flip-flops, shift registers, applications of shift registers,serial to parallel converter, parallel to serial converter, ring counter, ripple(Asynchronous)counters,synchronouscounters,countersdesignusingflipflops,ap plicationsofcounters.

Digital toAnalogconverters,Analogtodigitalconverters.

REFERENCEBOOKS:

1. IntegratedElectronics:AnalogandDigitalCircuitsandSystems,2/e,JaccobMillman,C hristos Halkias and ChethanD. Parikh,TataMcGraw-HillEducation, India,2010.

2. PrinciplesofElectronicDevices&circuits—BLThereja&Sedha—SChand

3. DigitalDesign,5/e,MorrisManoandMichaelD.Cilette,Pearson,2011.

4. ElectronicDevicesandCircuits,JimmyJCathey,Schaum"soutlineseries,1988.

5. DigitalPrinciples,3/e,RogerL.Tokheim,Schaum"soutlineseries,1994.

6. AnalogandDigitalElectronics,DrS.Salivahanan2019McGraw-Hill Education

AM213	**Operating Systems**

Objectives

- Toknow
  thebasicssuchasprocessandCPUschedulingalgorithmsTounderstandthecritical
  regionsanddeadlockproblem

- Tounderstandvirtualmemoryconcept,thrashingproblemandpagereplacemental
  gorithms

- Tounderstandthefiletables,accessalgorithms,andspoofing

UNIT–I   (16Periods)

Introduction: OperatingSystemStructure–OperatingSystemOperations–Process
Management – Memory Management –Storage Management –ProtectionandSecurity–
DistributedSystems–SpecialpurposeSystems–ComputingEnvironments.

System Structure: Operating System Services – User Operating System Interface –
SystemCalls–TypesofSystem   Calls–System   Programs–
OperatingSystemDesignandImplementation–OperatingSystemStructure–
VirtualMachine–OperatingSystemGeneration –SystemBoot.

ProcessConcept: Overview–ProcessScheduling–OperationsonProcesses–
Interprocess Communication – Examples of IPC Systems – Communication in
ClientServerSystems.

UNIT–II   (16Periods)

MultithreadedProgramming: Overview–MultithreadingModels–ThreadLibraries–
ThreadingIssues–OperatingSystemExamples.

Process   Scheduling: Basic Concepts – Scheduling   Criteria   –
            SchedulingAlgorithms–MultipleProcessorScheduling–ThreadScheduling.

Synchronization: Background–TheCriticalSectionProblem–Peterson'ssolution
–SynchronizationHardware–Semaphores–ClassicProblemofSynchronization–Monitors–
SynchronizationExamples–AtomicTransaction.

UNIT–III   (16Periods)

Deadlocks: System   Model–DeadlockCharacterization–MethodsforHandlingDeadlocks–
Deadlock   Prevention –Deadlock   Avoidance– Deadlock   Detection   –

RecoveryfromDeadlock.

Memory Management Strategies: Background – Swapping – Contiguous MemoryAllocation – Paging– Structureof the Page Table – Segmentation – Example:TheIntelPentium.

Virtual Memory Management: Background – Demand Paging – Copy on Write – PageReplacement–AllocationofFrames–Thrashing.

UNIT–IV   (16Periods)

File System : File Concept – Access Methods – Directory Structure – File SystemMounting–FileSharing–Protection.

Implementing File Systems : File System Structure – File System Implementation – DirectoryImplementation–AllocationMethods–FreeSpaceManagement–

EfficiencyandPerformance–Recovery–LogstructuredFileSystems.

UNIT–V

SecondaryStorageStructure: OverviewofMass–StorageStructure–DiskStructure – Disk Attachment – Disk Scheduling – Disk Management – Swap SpaceManagement– RAIDstructure.

I/OSystems: Overview–I/OHardware–ApplicationI/OInterface–KernalI/OInterface– TransformingI/OrequeststoHardwareOperations–Streams–Performance.

TEXTBOOKS:

- Silberschatz&Galvin,'OperatingSystemConcepts',5thedition,JohnWiley&Sons(Asia)Pvt.Ltd.

REFERENCEBOOKS:

1. William Stallings,"OperatingSystems–Internals and DesignPrinciples", 5/e,Pearson.
2. CharlesCrowley,'OperatingSystems:ADesign-OrientedApproach',TataMcGrawHill Co.,1998edition.
3. AndrewS.Tanenbaum,'ModernOperatingSystems',2ndedition,1995,
4. Bhatt,AnIntroductiontoOperatingSystems-PHI

Course Outcomes

- ImplementCPUschedulingalgorithmsandresolveproblemsrelatedtocriticalregions
- ImplementpagereplacementalgorithmslikeFCFS,LRU,etc.
- Implementfilesystems,logstructuredfilesystem

AM214	**Data Structures Using C**

CourseObjectives:
Theobjectiveofthecourseisto
- Introducethefundamentalconceptofdatastructuresandabstractdatatypes
- Emphasizetheimportanceofdatastructuresindevelopingandimplementingefficient algorithms
- Describe how arrays,records,linkedstructures,stacks,queues,trees,andgraphsarerepresentedinm emoryandusedbyalgorithms

UNITI   **(15 Periods)**
DataStructures-
Definition,ClassificationofDataStructures,OperationsonDataStructures,AbstractDataType(ADT),
Preliminariesofalgorithms.Timeand Spacecomplexity, Asymptotic notations.

Searching- Linearsearch, Binarysearch, Fibonaccisearch.

Sorting-   Bubble   sort,   Selectionsort,Insertionsort,   Shell   sort,
Quicksort,merging(Mergesort)algorithms and their time complexity analysis.

UNITII   **(12 Periods)**
Linked List: Introduction, Single linked list, Representation of Linked list in memory,
Operationson Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked
list,ApplicationsonSingleLinkedlist,AdvantagesandDisadvantagesofSingleLinkedlist,DoubleL
inkedlist-Insertion,Deletion,CircularLinkedlist-Insertion,Deletion, Hashing algorithms.

UNITIII   **(16 Periods)**

Stacks: Introduction to Stacks, Representation of Stacks -using Arrays and using Linked list,
Operations on Stacks, Implementation of Stacks-using Arrays and using Linked list,
Applications-
Reversinglist,FactorialCalculation,InfixtoPostfixConversion,EvaluatingPostfixExpressions.

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked
list,Operations on Queues, Implementation of Queues-using Arrays and using Linked list,
Application of Queues-CircularQueues,Dequeues,PriorityQueues.

UNITIV   **(15 Periods)**
Trees: Basic Terminology in Trees,Binary Trees-Properties,Representation of Binary
Treesusing Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations:
Insertion,Deletion, Tree Traversals, Applications-Expression Trees, Balanced Binary Trees-
AVLTrees,Insertion,DeletionandRotations, Heaps and Heapsort.

UNITV   **(12 Periods)**
Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked
list,Graph Traversals (BFS & DFS), Applications- Minimum Spanning Tree Using Prims
&KruskalsAlgorithm.

TextBooks:
1) DataStructuresandalgorithmanalysisinC,2ndEdition,MarkAllen Weiss,1996.
2) Data structures and algorithms by Alfred V Aho.John E Hopcroft, Jeffrey D Ullman, Pearson Education.
3) Data structures, Algorithms and Applications in C++, S.Sahni, University Press (India) Pvt.Ltd, 2nd edition, Universities Press, Pvt. Ltd.
4) Classic Data Structures, 2/e, Debasis, Samanta, PHI, 2009.

ReferenceBooks:
1) DataStructures:APseudoCodeApproach,2nded,
RichardF.Gilberg,BehrouzA.Forouzon,Cengage,2004.
2) Data structures using C.2nd Edition, ReemaThareja, Oxford, 2014.
3) DataStructureswithC,Seymour Lipschutz,2nded,TMH

e-Resources:
1) https://nptel.ac.in/courses/106105085
2) http://algs4.cs.princeton.edu/home/
3) https://www.codechef.com/certification/data-structures-and-algorithms/prepare
4) https://www.geeksforgeeks.org/data-structures/?ref=shm

CourseOutcomes:
Aftercompletingthiscourseastudentwillbeableto:
- Summarizetheproperties,interfaces,andbehaviorsofbasicabstractdatatypes
- Discussthecomputationalefficiencyoftheprincipalalgorithmsforsorting &searching
- Usearrays,records,linkedstructures,stacks,queues,trees,andGraphsinwritingprogr ams
- Demonstratedifferentmethodsfortraversingtrees
- Demonstratedifferentmethodsfortraversinggraphs

| AM 215 | **SOFTWARE ENGINEERING** |

Course Objectives

- The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
- Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

Course Outcomes

- Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
- Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
- Will have experience and/or awareness of testing problems and will be able to develop a simpletestingreport

UNIT-I

Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths.

A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI), process patterns, process assessment, personal and team process models.

Process models: The waterfall model, incremental process models, evolutionary process models, the unified process.

UNIT-II

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, Interface specification, the software requirements document. Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

System models: Context models, behavioral models, data models, object models, structured methods.

UNIT-III

Design Engineering: Design process and design quality, design concepts, the design model. Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

UNIT-IV

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging. Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

UNIT-V

Metrics for Process and Products: Software measurement, metrics for software quality. Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.

Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

TEXTBOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.

2. Software Engineering- Sommerville, 7th edition, Pearson Education.

3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

REFERENCEBOOKS:
1. Software Engineering, an Engineering approach- James F. Peters, WitoldPedrycz, John Wiley.
2. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.
3. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

| **AM 216** | **Value Ethics and Gender Culture** |

CourseObjectives:

1. To understand about the importance of ethical values

2. To understand the significance of human conduct and self-development

3. To enable students to imbibe and internalize the value and Ethical behaviour in personal and

Professional lives.

4. To provide a critical perspective on the socialization of men and women.

5. To create an awareness on gender violence and condemn it.

CourseOutcomes

1. To enable the student to understand the core values that shapes the ethical behaviour. And Student will be able to realize the significance of ethical human conduct and self-development
2. Students will be able to inculcate positive thinking, dignity of labour and religious tolerance.
3. The students will learn the rights and responsibilities as an employee and a team member.
4. Students will attain a finger grasp of how gender discrimination works in our society and how to counter it.
5. Students will develop a better understanding on issues related to gender and Empowering students to understand and respond to gender violence.

UNIT-I

Values and Self-Development–social values and individual attitudes, Importance of cultivationof values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness,Honesty, Humanity, Power of faith, National unity, Patriotism, Love for nature,Discipline.

UNIT II

Personality and Behaviour Development-positive thinking, punctuality, avoiding fault finding, Free from anger, Dignity of labour, religious tolerance, Aware of self-destructive habits.

UNIT- III:

Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics,

ValueEducation, Dimensions of Ethics, Profession and professionalism, Professional Associations, ProfessionalRisks, Professional Accountabilities, Professional Success, Ethics and Profession.

UNIT–IV:

Introduction to Gender - Definition of Gender, Basic Gender Concepts and Terminology, Attitudes towards Gender, Social Construction of Gender.

UNIT-V:

Gender-based Violence -The concept of violence, Types of Gender-based violence, therelationship between gender, development and violence, Gender-based violence from a human rights perspective.

Text Books

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whit beck, 2e, Cambridge University Press 2015.
3. A Bilingual Textbook on Gender" written by A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, VasudhaNagaraj, AsmaRasheed, GoguShyamala, DeepaSreenivas and Susie Tharu and published by Telugu Akademi, Hyderabad,Telangana State in the year 2015.

ReferenceBooks

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. AbdulaliSohaila. "I Fought For My Life...and Won."Availableonlineat: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/
3. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins,4e , Cengage learning, 2015.
4. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008

AM251	**Analog&DigitalElectronicsLab**

AnalogElectronics:

1. CharacteristicsofCommonBaseConfiguration
2. CharacteristicsofCommonEmitterConfiguration
3. Design a Common Emitter amplifier with self-bias and determine the voltage gain toplotthefrequency response.
4. DesignaCommonCollectoramplifierwithself-biasanddeterminethevoltagegaintoplotthefrequency response.
5. DesignaCommonBaseamplifierwithself-biasanddeterminethevoltagegaintoplotthefrequency response.

DigitalElectronics:

6. RealizationofbasicLogicgatesusingUniversalgates
7. Design and construct half-adder and full-adder circuits and verify the truth tablesusinglogicgates.
8. Designandimplementa4-bitadder/subtractorusingIC7483.
9. Designandimplementmultiplexeranddemultiplexerusinglogicgates
10. Verify The Truth Tables of Flip-Flops using gates and perform the conversion of Flip-Flops(JK-T,JK-D)
11. Designandverify 4bitripplecounterandMod-10 ripplecounter
12. Designandimplementthe3bitsynchronous up/downcounter.

AM 252	UNIX & OS LAB

LIST OF EXPERIMENTS

CYCLE-1

1. Working with different Unix commands, Pipes, I/O redirection.
 2. Write Shell Programs for the following
    a) Display all the words which are entered as command line arguments.
    b) Changes Permissions of files in PWD as rwx for users.
    c) To print the list of all sub directories in the current directory
    d) Program which receives any year from the keyboard and determine whether the year is leap year or not. If no argument is supplied the current year should be assumed.
    e) Program which takes two file names as arguments, if their contents are same then delete the second   file.
 3. Write shell scripts for the following
    a) To print the given number in the reversed order.
    b) To print first 25 Fibonacci numbers.
    c) To print the Prime numbers between the specified range.
    d) To print the first 50 Prime numbers.
 4. Write shell scripts for the following
    a) To print gcd of a given number.
b)To swap two numbers.
c)To Execute ls command
 5. Write shell scripts for the following
    a) To delete all lines containing the word 'unix' in the files supplied as arguments.
    b) Menu driven program which has the following options.
        i) contents of/etc/password
        ii) list of users who have currently logged in.
        iii) present working directory.
        iv) exit.

CYCLE-2

1. Simulate the following CPU scheduling algorithms.
a) Round Robin b) SJF c) FCFS d) Priority
2. Simulate all file allocation strategies
  a) Sequential b) Indexed c) Linked
3. Simulate MVT and MFT
4. Simulate all File Organization Techniques
  a) Single level directory b) Two level c) Hierarchical d) DAG
5.SimulateBankersAlgorithmforDeadLockAvoidance
6.SimulateBankersAlgorithmforDeadLockPrevention
7. Simulate all page replacement algorithms
  a) FIFO b) LRU c) LFU
8.ProgramsonInterprocesscommunicationusingpipesandsharedmemory

AM253	Data Structures Lab

LIST OF EXPERIMENTS

Exercise-1(Searching)
a) WriteCprogramthatusebothrecursiveandnon-recursivefunctionstoperformLinearsearchforaKeyvalueinagivenlist.
b) WriteCprogramthatusebothrecursiveandnon-recursivefunctionstoperformBinarysearchforaKeyvalueinagivenlist.

Exercise–2(Sorting)
a) WriteCprogramthatimplementBubblesort,tosortagivenlistofintegersinascendingorder
b) WriteCprogramthatimplementInsertionsort,tosortagivenlistofintegersinascendingorder.
c) WriteCprogramthatimplementradixsort,tosortagivenlistofintegersinascendingorder
d) WriteCprogramthatimplementQuicksort,tosortagivenlistofintegersinascendingorder
e) WriteCprogramthatimplementmergesort,tosortagivenlistofintegersinascendingorder

Exercise-3(SinglyLinkedList)
a) WriteaCprogramthatusesfunctionstocreateasinglylinkedlist and performinsertion, deletionoperationsonasinglylinkedlist.
b) WriteaCprogramthatusesfunctionstocreateadoublylinkedlistandperforminsertion, deletionoperationonadoublylinkedlist.
c) WriteaCprogram to implement hash table.

Exercise-4(Queues & Stacks)
a) WriteCprogramthatimplementQueue(itsoperations)usingarrays.
b) WriteCprogramthatimplementstack(itsoperations)usingLinkedlist
c) WriteaCprogramthatusesStacktoconvertinfix to postfixexpression

Exercise-5(BinarySearchTree)
a) WriteaCprogramtoCreate a BST and perform insertanodeinto a BST,delete a nodefroma BST.
b) WritearecursiveCprogramfortraversingabinary search treeinpreorder,inorder and postorder.
c) WriteCprogramthatimplementheapsort,tosortagivenlistofintegersinascendingorder

Exercise-6(Graphs)
a) WriteaCprogram to implement DFS traversal.
b) WriteaCprogram to implement kruskal's algorithm

AM254	SCRIPTING LANGUAGE

CYCLE - I

Basics - Introduction

1. Practice Internet applications
2. Explore Web browsers , search engines
3. Familiarise with web portals, e-commerce sites, blogs etc

HTML
4. Basic Html Tags
5. Hyper Links, Tables & Multimedia
6. Frames &iFrames

CSS
7. Inline, Internal and External Style sheets

CYCLE – II

JAVA SCRIPT
8. Demonstrate java script control statements.
9. Demonstrate java script functions.
10. Registration Form with Table
11. String, Math & Date Object's predefined methods
12. Event Handling - Validating Simple Form
13. Event Handling - Multi-Validating Registration Form
14. Event Handling - Background Color Change
15. Event Handling - calendar for the month and year by combo box
16. Event Handling - OnMouseover event
17. Event Handling - OnMouseover using objects

CYCLE - III

XML
18. Demonstrate the creation of XSL style sheets to render XML document.
19. Demonstrate to retrieve and manipulate XML data using java script

AJAX

20. Demonstrate Rich Internet Applications with Ajax
21. Demonstrate the full scale Ajax enabled application

PHP
22. File operation
23. Regular Expression, Array, Math, Date functions
24. Demonstrate the form processing and business logic in PHP

CSE/AM 221	DISCRETE MATHEMATICS

UNIT – I

Foundations: Sets, Relations and Functions, Methods of Proof and Problem Solving Strategies, Fundamentals of Logic, Logical Inferences, Methods of Proof of an implication, First order Logic & Other methods of proof, Rules of Inference for Quantified propositions, Disjunction normal forms, Conjunction normal forms, Mathematical Induction.

UNIT – II

Elementary Combinatorics, Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with repetitions, Enumerating Permutation with Constrained repetitions.

UNIT – III

Recurrence relations, Solving recurrence relations by Substitution and generating functions. The methods of characteristic roots.Relations and digraphs, Special properties of binary relations, Equivalence relations.Operations on relation.

UNIT – IV

Ordering relations, Lattices and Enumerations, Paths and Closures, Directed Graphs and Adjacency Matrices, Application : Topological Sorting.

UNIT-V:

Graphs: Basic Concepts, Isomorphisms and Subgraphs, Planar Graphs, Euler's Formula; Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four Color Problem.

TEXT BOOK

1. Toe L.Mott, Abraham Kandel& Theodore P.Baker, Discrete Mathematics for Computer Scientists & Mathematicians, PHI 2nd edition,2008.

2. J.P. Trembly and R. Manohar- Discrete Mathematics for Computer Scientists & Mathematicians, PHI Ltd., New Delhi, 2nd Edition, 2008.

3. Narasinghdeo Graph Theory ,Narosa Publishers.

4. SatyanarayanaBhavanari. andSyamprasadKuncham. "Discrete Mathematics and Graph Theory" by PHI, 2014 second edition.

5. SatyanarayanaBhavanari,T.V.PradeepKumar,Sk. Mohiddinshaw" Mathematical Foundations for Computer Sciences" by BS Publications, first editions, 2016

REFERENCE BOOKS

1. T. Sengadir- Discrete Mathematics-Pearson Education
2. C.L. Liu and D.P. Mohapatra-Elements of Discrete Mathematics, Tata McGraw-Hill ,3rd Edition, 2008.
3. Seymour Lipschutz, Lipson-Discrete Mathematics-Scaums outlines-TMH.
4. Santha-Discrete Mathematics-Cengage Learning
5. Kenneth H Rosen-Discrete Mathematics & its Applications , TMH, 6ht Edition,2009.

CSE/AM 222	COMPUTER ORGANIZATION & ARCHITECTURE

Objectives of the course: To expose the students to the following:

  • How Computer Systems work & the basic principles
  • Instruction Level Architecture and Instruction Execution
  • The current state of art in memory system design
  • How I/O devices are accessed and its principles.
  • To provide the knowledge on Instruction Level Parallelism
  • To impart the knowledge on micro programming
  • Concepts of advanced pipelining techniques.

UNIT I

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU–registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs.

Data representation: signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

UNIT II

Introduction to x86 architecture.

CPU control unit design: hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU.

Memory system design: semiconductor memory technologies, memory organization.

UNIT III

Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers–program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes–role of interrupts in process state transitions, I/O device interfaces – SCII, USB

UNIT IV

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency

UNIT V

Memory organization : Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

Text books:

1. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.

2. "Computer Organization and Embedded Systems", 6th Edition by CarlHamacher, McGraw Hill Higher Education.

3. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.

4. " Computer System Architecture " , 3rd edition by M. Morris Mano

Reference books

1. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill.

2. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

Course outcomes

- Draw the functional block diagram of a single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.

- Write assembly language program for specified microprocessor for computing 16 bit multiplication, division and I/O device interface (ADC, Control circuit, serial port communication).

- Write a flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.

- Given a CPU organization and instruction, design a memory module and analyze its operation by interfacing with the CPU.

- Given a CPU organization, assess its performance, and apply design techniques to enhance performance using pipelining, parallelism and RISC methodology.

Course Objectives: Students will be able to

- Understand the fundamental concepts of artificial intelligence, and theirenvironment, various Search techniques.

- Understand knowledge representation using predicate logic and rules

- Understand the planning techniques.

- Understands how to design and solve Learning techniques and Expert systems.

- Enable the student to apply artificial intelligence techniques in applications which involve perception, reasoning and learning.

AM 223	JAVA PROGRAMMING

COURSE OBJECTIVES:

1. To teach principles of Object-Oriented Programming paradigm including abstraction, encapsulation, inheritance and polymorphism.
2. To impart fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
3. To inculcate concepts of inheritance to create new classes from existing one & Design the classes needed given a problem specification.
4. To familiarize the concepts of packages and interfaces.
5. To facilitate students in handling exceptions.
6. To demonstrate the concept of event handling used in GUI.

UNIT I

JAVA BASICS: Review of Object Oriented concepts, History of Java, Java buzzwords, JVM architecture, Data types, Variables, Scope and life time of variables, arrays, operators, control statements, type conversion and casting, simple java program, constructors, methods, Static block, Static Data, Static Method String and String Buffer Classes, Using Java API Document.

UNIT II

INHERITANCE AND POLYMORPHISM: Basic concepts, Types of inheritance, Member access rules, Usage of this and Super key word, Method Overloading, Method overriding, Abstract classes, Dynamic method dispatch, Usage of final keyword.

PACKAGES AND INTERFACES: Defining package, Access protection, importing packages, Defining and Implementing interfaces, and Extending interfaces.

I/O STREAMS: Concepts of streams, Stream classes- Byte and Character stream, Reading console Input and Writing Console output, File Handling.

UNIT III

EXCEPTION HANDLING: Exception types, Usage of Try, Catch, Throw, Throws and Finally keywords, Built-in Exceptions, Creating own Exception classes.

MULTI THREADING: Concepts of Thread, Thread life cycle, creating threads using Thread class and Runnable interface, Synchronization, Thread priorities, Inter Thread communication.

UNIT IV

AWT CONTROLS: The AWT class hierarchy,Working with Frame class, Color, Fonts.

EVENT HANDLING: Events, Event sources, Event Listeners, Event Delegation Model (EDM), Handling Mouse and Keyboard Events, Adapter classes and layout managers

SWINGS: Introduction to Swings, Hierarchy of swing components. Containers, Top level containers - JFrame, JWindow, JDialog, JPanel, JButton, JToggleButton, JCheckBox, JRadioButton, JLabel,JTextField, JTextArea, JList, JComboBox, JScrollPane.

UNIT V

APPLETS: Life cycle of an Applet, Differences between Applets and Applications, Developing applets, simple applet,passing parameters to an applet.

Accessing Databases with JDBC: Types of Drivers, JDBC Architecture, JDBC classes and Interfaces, Basic steps in developing JDBC applications, Creating a new database and table with JDBC.

REFERENCE BOOKS:

1. Herbert Schildt (2010), The complete reference, 7th edition, Tata Mcgraw Hill, New Delhi.
2. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I – Fundamentals", Eighth Edition, Sun Microsystems Press, 2008.
3. Head First Java, O'rielly publications.
4. T. Budd (2009), An Introduction to Object Oriented Programming, 3rd edition, Pearson Education, India.
5. Nino, F. A. Hosch (2002), An Introduction to programming and OO design using Java, John Wiley & sons, New Jersey.
6. Y. Daniel Liang (2010), Introduction to Java programming, 7th edition, Pearson education, India.

COURSE OUTCOMES:

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

1. Analyse the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP like encapsulation, Inheritance and Polymorphism .
2. Design and develop java programs, analyse, and interpret object-oriented data and report results.
3. Design an object-oriented system, AWT components and multithreaded processes as per needs and specifications.
4. Participate and succeed in competitive examinations like GATE, Engineering services, recruitment interviews etc.

AM 224	ARTIFICIAL INTELLIGENCE

Course Objectives: Students will be able to

- Understand the fundamental concepts of artificial intelligence, and theirenvironment, various Search techniques.
- Understand knowledge representation using predicate logic and rules.
- understand the planning techniques.
- understand how to design and solve Learning techniques and Expert systems.
- Enable the student to apply artificial intelligence techniques in applications which involve perception, reasoning and learning.

UNIT-I

Introduction to AI: What is AI, history of AI,foundations of AI, applications, types of AI, intelligent agents, and current trends in AI.

Problem Solving: Solving Problems by Searching, heuristic search techniques, Adversal search, Min-Max algorithm, Alpha Beta pruning, constraint satisfaction problems.

UNIT-II

Logical Agents: Knowledge Based Agents, the Wumpus World, Logic and PropositionalLogic.

Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clausesand definite clauses, Forward and Backward chaining.

First Order Logic: Inferences in First Order Logic, Propositional vs. First Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

UNIT-III

Slot and Filler Structures: Semantic Nets, Conceptual Dependency, Scripts.

Planning: Overview - An Example Domain, The Blocks World, Component of PlanningSystems, Goal Stack Planning, Hierarchical planning, Reactive systems.

UNIT-IV

Learning: Introduction to learning, Rote learning, Learning by taking advice, Learning inproblem solving, Learning from examples, Induction Learning, Explanation Based Learning.

Expert Systems: Representing and using domain knowledge, Expert system shells,Explanation, Knowledge Acquisition.

UNIT V

Perception: Introduction, Early Image Processing operations- Edge detection, image segmentation. Object recognition, Using vision for manipulation and navigation.

Robotics: Introduction, Robot hardware, robotic perception, planning to move, Robotic software architectures, application domains.

<u>**Textbooks:**</u>

1. Elaine Rich & Kevin Knight, 'Artificial Intelligence', 2nd Edition, (Tata McGrawHill Edition).

2. Artificial Intelligence-A modern approach-by StaurtRussel, Peter Norvig, 2nd edition, PHI/Pearson.

<u>**References:**</u>

1. Robotics: Fundamental Concepts and Analysis –AshitavaGoshal, oxford.

2. A Textbook of Robotics 1-Basic Concepts-M. Shoham-Springer US.

3. Patrick Henry Winston. Artificial Intelligence. Pearson Education, 3rdedition, 2007.

4. SarojKaushik. Artificial Intelligence. CENGAGE Learning, 1 edition,2020.

Course Learning Outcomes: Students will be able to

- Understand the fundamental concepts of artificial intelligence, search techniques for solving simple AI problems and their environments.

- Apply knowledge representation using predicate logic and rules.

- Utilize the planning techniques.

- Possess the knowledge of the concepts of Learning and Expert Systems.

- Write AI programs and construct small robots capable of performing perception and movement based on techniques learnt in the course.

AM 225	DESIGN & ANALYSIS OF ALGORITHMS

Objectives:

- Analyse the asymptotic performance of algorithms.

- Write rigorous correctness proofs for algorithms.

- Demonstrate a familiarity with major algorithms and data structures.

- Apply important algorithmic design paradigms and methods of analysis.

- Synthesize efficient algorithms in common engineering design situations.

Unit I

Background: Introduction, algorithms specification, time and space complexity, performance analysis. **Divide and Conquer:** Binary search, merge sort, quick sort, Strassen's matrix multiplication, maximum and minimum problem.

Partition ADT: Disjoint sets, operations on sets, weighted union or union by rank, pathCompression.

Unit II

Greedy Methods: General method, optimal merge patterns, optimal storage on tapes, Knapsack problem, job scheduling problem, single source shortest path problem.

Unit III

Dynamic Programming: General method, multistage graphs, 0/1 Knapsack problem, longest common subsequence, string editing, matrix chain multiplication, travelling salesman problem, optimal binary search trees.

Unit IV

Back Tracking: General method, 4-queen problem, sum of subset problem, graph colouring, Hamiltonian cycles.

Unit V

Branch and Bound: General method, 0/1 knapsack problem, travelling salesman problem.

NP Hard and NP Complete: deterministic and nondeterministic algorithms, NP Hard and NP complete.

Reference Books:

1. Cormen T. H, Leiserson C. E, Rivest R. L, and Stein C., Introduction to Algorithms, Prentice-Hall of India, 2nd Ed., 2001.

2. Brassard G., Fundamentals of Algorithmics, Prentice-Hall of India, 2003.

3. Aho A. V., Design and Analysis of Algorithms, Addison Wesley, 2001.

4. Horowitz E., Computer Algorithms, Galgotia Publications, 1998

Course Outcomes:

Students who complete the course will have demonstrated the ability to do the following:

- Ability to understand mathematical formulation, complexity analysis and methodologies to solve recurrence relations for algorithms.

- Ability to design algorithms using standard paradigms like: Greedy, Divide and Conquer, Dynamic Programming, Backtracking and Branch and Bound.

- Ability to understand NP class problems and formulate solutions using standard approaches.

- Ability to apply algorithm design principles to derive solutions for real life problems and comment on complexity of solution.

COURSE OBJECTIVES:

- To teach fundamentals of object oriented programming in Java. Understand various concepts of JAVA.

- To familiarize Java environment to create, debug and run simple Java programs.

- To demonstrate java compiler and eclipse platform and learn how to use Net Beans IDE to create Java Application.

Programs:

1. Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer. (use Scanner class to read input).

2. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EBconnection (i.e domestic or commercial). Commute the bill amount using the following tariff. If the type of the EB connection is domestic, calculate the amount to be paid as follows:

   - First 100 units - Rs. 1 perunit

   - 101-200 units - Rs. 2.50 perunit

   - 201 -500 units - Rs. 4 perunit

   - >501units - Rs. 6 perunit

   If the type of the EB connection is commercial, calculate the amount to be paid as follows:

   - First 100 units - Rs. 2 perunit

   - 101-200 units - Rs. 4.50 perunit

   - 201 -500 units - Rs. 6 perunit

   - >501units - Rs. 7 perunit

3. Write a Java program to multiply two given matrices.

4. Write a Java program that checks whether a given string is a palindrome or not.

5. Write a Java program to create a Student class and find the grade of the student.

6. Write a java program to create an abstract class named Shape contains number Of Sides ( ) method and Trapezoid, Triangle and Hexagon classes extends the class Shape.

7. Write a Java program to read copy content of one file to other by handling all file related exceptions.

8. Write a Java program that reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

9. Write a Java program that reads a file and displays the file on the screen with line number before each line.

10. Write a Java program that displays the number of characters, lines and words in a text file.

11. Write a Java program that creates three threads. First thread displays "Good Morning" everyone second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every three seconds.

12. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.

13. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result.

14. Develop a Java application that simulates a traffic light. The program lets the user select one of three lights: Red, Yellow or Green with radio buttons. On selecting a button an appropriate message with―STOP ‖or―READY ‖or‖ GO ‖should appear above the buttons in selected color. Initially, there is no message show.

15. Write a Java program for handling mouse events.

16. Write a Java program for handling key events using Adapter classes.

17. Develop a Java application to establish a JDBC connection, create a table student with properties name, register number, mark1, mark2, mark3. Insert the values into the table by using the java and display the information of the students at front end.

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

1. Implement Object oriented features using Java.

2. Apply the concept of polymorphism and inheritance.

3. Implement exception handling.

4. Develop network and window application using awt and swings.

Course Objectives:

1. Find appropriate idealizations for converting real world problems into AI search problemsformulated using the appropriate search algorithm.

2. Search Formalization

Experiments:

1. Write a LISP Program to solve water Jug Problem using Heuristic Functions.

2. Study of PROLOG.

3. Write a program in prolog to implement simple arithmetic.

4. Write a program in prolog to implement simple facts and Queries.

5. Program to demonstrate family relationship.

6. Program to read address of a person using compound variable.

7. Write a program in prolog to solve Monkey banana problem.

8. Write a program in prolog to solve Tower of Hanoi.

9. Write a program in prologto solve traveling salesman problem.

10. Write a program to solve 8 queens problem

Course Outcomes:

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

- Apply the basic principles of AI in problem solving using PROLOG .

- Implement different algorithms using PROLOG

Course Objectives:

The main course objective of Advanced English Communication Skills Lab is to develop the student's Non-Verbal Communication, Cognitive and Poignant Skills, Interview Skills, Employability and Interpersonal skills, which relate to situations in the work place. The skills imparted to the learners are body language, leadership, time management, team management, assertive skills, group discussions, interview techniques and positive work ethics ...etc.

The methodology includes Interactive sessions, Role Play, Team Work/Group Work/Pair Work and Peer Evaluation. The emphasis is on learning by doing to improve the learners' life skills.

Course Outcomes:

1. To realize the importance of communication skills in job arena To enhance the students ability to communicate.

2. Able to learn vocabulary for GRE, TOEFL, IELTS,IES etc

3. Capable to participate in all recruitment procedures

4. Able to communicate effectively over a phone and proficient to demonstrate telephoning skills

5. Able to describe procedures and improves analytical thinking

6. Able to know the importance of personality development

Syllabus:

Module-l Communication Skills

I. Verbal

a) Types of Communication

b) Barriers to Communication

c) Strategies for effective communication

II. Nonverbal Skills

a) Body Language – Voluntary and Involuntary

b) Kinesics

c) Facial Expressions

d) Proxemics

e) Oculesics

f) Haptics and Chronemics

Module-2: Advanced Vocabulary

a) Word list (GRE & TOEFL related)

b) One Word Substitutes

c) Idioms

Module-3: Employability Skills (Ref: 6)

a) Interview Skills

b) Group Discussion

c) Resume Writing

Module-4: Telephonic Skills

a) Formal &Informal interaction

b) Receiving Messages & Complaints

c) Tone modulation

Module-5: Descriptions

a) Process Description

 b) Pictures

c) Narration

Module-6: Behavioural Skills

a) Emotional Intelligence

b) Positive Attitude

c) Team Work

d) Organization Skills

1. CLASS AND OBJECTS:
   a. Create a class ATM and define ATM operations to create account, deposit, check_balance, withdraw and delete account. Use constructor to initialize members.
   b. Make a class Employee with a name and salary. Make a class Manager inherit from Employee. Add an instance variable, named department. Write a method that prints manager's name, department and salary. Make a class Executive inherit from Manager. Write a method that prints the string "Executive" followed by the information stored in the Manager super class object.
   c. A hospital wants to create a database regarding its indoor patients. The information to store include a) Name of the patient b) Date of admission c) Disease d) Date of discharge. Create a structure to store the date (year, month and date as its members). Create a base class to store the above information. The member function should include functions to enter information and display a list of all the patients in the database. Create a derived class to store the age of the patients. List the information about to store the age of the patients. List the information about all the pediatric patients (less than twelve years in age).

2. NUMPY:
   a. Using Numpy, write a basic array of operations on single array to add x to each element of array and subtract y from each element of array.
   b. Using Numpy, write a program to add, subtract and multiply two matrices.
   c. Write a Python program to do the following operations:
   Library: NumPy
   1. Create multi-dimensional arrays and find its shape and dimension
   2. Create a matrix full of zeros and ones
   3. Reshape and flatten data in the array
   4. Append data vertically and horizontally
   5. Apply indexing and slicing on array
   6. Use statistical functions on array - Min, Max, Mean, Median and Standard Deviation
   7. Dot and matrix product of two arrays
   8. Compute the Eigen values of a matrix
   9. Solve a linear matrix equation such as $3 * x0 + x1 = 9$, $x0 + 2 * x1 = 8$
   10. Compute the multiplicative inverse of a matrix
   11. Compute the rank of a matrix
   12. Compute the determinant of an array

3.GUI:
   a. Design a GUI based calculator to perform arithmetic operations like addition, subtraction,   multiplication and division. (Hint: Expression Calculator using tk)
   b. Design a GUI based application to convert temperature from Celsius to Fahrenheit.
   c. Write a python program to perform various database operations (create, insert, delete, update).

4. Pandas Library: Selection
   1. Write a program that converts Pandas DataFrame and Series into numpy.array.
   2. Write a program that demonstrates the column selection, column addition, and column deletion.
   3. Write a program that demonstrates the row selection, row addition, and row deletion.
   4. Get n-largest and n-smallest values from a particular column in Pandas dataFrame

5. Pandas Library: Visualization

a) Write a program which use pandas inbuilt visualization to plot following graphs:
 i. Bar plots ii. Histograms iii. Line plots iv. Scatter plots
b) Write a program to demonstrate use of groupby() method.
c) Write a program to demonstrate pandas Merging, Joining and Concatenating
d) Creating dataframes from csv and excel files.

6. GRAPHICS

a. Consider turtle object. Write functions to draw triangle, rectangle, polygon, circle and sphere.
b. Design a Python program using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorizing them into distinction, first class, second class, third class and failed.
c. Write a python program to implement the following figures using turtle.
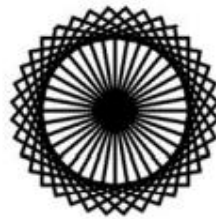
Reference Books:
1. Michael H Goldwasser, David Letscher, "Object Oriented Programming in Python", Prentice Hall, 1st Edition, 2007.
2. YashavantKanetkar, AdityaKanetkar, "Let us Python, BPB publication, 1st Edition, 2019.
3. Ashok Kamthane, AmitKamthane, "Programming and Problem solving with Python", McGraw Hill Education (India) Private Limited, 2018.
4. TanejaSheetal, Kumar Naveen, "Python Programming – A Modular Approach", Pearson, 2017. 5. R NageswaraRao, "Core Python Programming", Dreamtech Press, 2017 Edition.
5. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, "How to Think Like a Computer Scientist: Learning with Python 3", 3rd Edition, 2015.
6. Paul Barry, "Head First Python a Brain Friendly Guide", O'Reilly, 2 nd Edition, 2016.
7. DainelY.Chen "Pandas for Everyone Python Data Analysis" Pearson Education, 2019.
a. Martin C. Brown (Author), "Python: The Complete Reference" McGraw Hill Education, Fourth edition , 2018.

ACHARYANAGARJUNAUNIVERSITY
SCHEME OF INSTRUCTION AND EXAMINATION
w.e.f. 2022-2023 R20 Syllabus
ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (AI&ML)
III/IVB.TECH-SEMESTER I

S.No	CourseDetails		Category	Scheme of Instruction			SchemeofExamination		
	Code	SubjectName		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	CSE/AM 311	Automata Theory & Compiler Design	PC	4	1	0	30	70	3
2	AM 312	DBMS	PC	4	1	0	30	70	3
3	AM 313	Natural Language Processing	PC	4	1	0	30	70	3
4	AM 314	Job Elective – 1	JE-1	4	1	0	30	70	3
5	CSE/AM 315	Professional Elective-1	PE-1	4	1	0	30	70	3
6	CSE/AM 316	Constitution of India	MC	3	0	0	30	70	0
7	AM 351	DBMS LAB	PC	0	0	3	30	70	1.5
	AM 352	JE-1 LAB	JE-1 Lab	0	0	3	30	70	1.5
8	CSE/ AM 353	Mobile Application development Lab	Skill	0	0	3	30	70	2
9	CSE/ AM354	Internship Program		0	0	3	100	0	1.5
Total Credits									**21.5**
Internship 2 months (Mandatory) during Summer vacation									
Honors/Minor Courses (The hours distribution can be 3-0-2 or 3-1-0 also)									**4**

JE-1 (Lab Oriented):

> **AM 314 A. Machine Learning**

> **AM 314 B. Internet of Things (IoT)**

> **AM 314 C. Computer Vision**

> **AM 314 D. Digital Image Processing**

PE-1:

CSE/AM 315 A. Computer Networks

CSE/AM 315 B. Software Project Management

CSE/AM 315 C. Advanced Computer Architecture.

CSE/AM 315 D. Distributed System

ACHARYANAGARJUNAUNIVERSITY

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w.e.f. 2022-2023 R20 Syllabus

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (AI&ML)

III/IVB.TECH-SEMESTER II

S.No	Code	SubjectName	Category	L	T	P	Internal	External	Credits
1	CSE/AM 321	Cryptography & Network Security	PC	4	1	0	30	70	3
2	CSE/AM 322	Data Engineering	PC	4	1	0	30	70	3
3	CSE/AM 323	Web Technologies	PC	4	1	0	30	70	3
4	CSE/AM 324	Job Elective – 2	JE-2	4	1	0	30	70	3
5	AM 325	Professional Elective-2	PE-2	4	1	0	30	70	3
6	CSE/AM 361	DE LAB	PC	0	0	3	30	70	1.5
7	CSE/AM 362	WT LAB	PC	0	0	3	30	70	1.5
8	CSE/AM 363	JE-2 LAB	JE-2 Lab	0	0	3	30	70	1.5
9	CSE/ AM 364	Full Stack Lab	Skill	0	0	3	30	70	2
Total Credits									21.5
Internship 2 months (Mandatory) during Summer vacation									
Honors/Minor Courses (The hours distribution can be 3-0-2 or 3-1-0 also)									4

JE-2 (Lab Oriented)

    CSE/AM 324 A. Network Programming

    CSE/AM 324 B. Introduction to block chain technology

    CSE/AM 324 C. Cyber Security

    CSE/AM 324 D. Advanced Databases

PE-2

    AM 325 A.Mobile Computing

    AM 325 B. Cloud Computing Architecture and Its Applications

    AM 325 C. Quantum Computing

    AM 325 D. Industry 4.0

ACHARYANAGARJUNAUNIVERSITY

SCHEME OF INSTRUCTION AND EXAMINATION

w.e.f. 2022-2023 R20 Syllabus

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (AI&ML)

IV/IVB.TECH-SEMESTER I

S.No	CourseDetails		Category	Scheme of Instruction			SchemeofExamination		
	Code	SubjectName		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	CSE/AM 411	Design of Deep Learning Networks	PC	4	1	0	30	70	3
2	CSE/AM 412	Design & Analysis of Parallel Algorithms	PC	4	1	0	30	70	3
3	CSE/AM 413	Data Science	PC	4	1	0	30	70	3
4	AM 414	Job Elective – 3	JE-3	4	1	0	30	70	3
5	CSE/AM 415	Open Elective-1	OE-1	4	1	0	30	70	3
6	CSE/AM416	Research Methodology	BS	0	0	3	30	70	3
7	CSE/AM 451	Tensor Flow	Skill Oriented Course	0	0	3	30	70	2
8	CSE/AM 452	Industrial / Research Internship (2 months) after 3rd year (to be evaluated during VII semester)	MC	0	0	3	100	0	3
Total Credits									23
Internship 2 months (Mandatory) during Summer vacation									
Honors/Minor Courses (The hours distribution can be 3-0-2 or 3-1-0 also)									4

JE-3 (Lab Oriented)

AM 324 A. Introduction to NoSQLDatabases

AM 324 B. AI chatbot

AM 324 C.Social Network Analysis

AM 324 D. Reinforcement Learning

OPEN ELECTIVE - 1

CSE/AM 415 A. Principles of Entrepreneurship

CSE/AM 415 B. Intellectual Property Rights

CSE/AM 415 C. Biomedical Applications

CSE/AM 415 D. Fundamentals of Robotics

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ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (AI&ML)
IV/IVB.TECH-SEMESTER II

S.No	CourseDetails		Category	Scheme of Instruction			SchemeofExamination		
	Code	SubjectName		Hours in a Week			Marks		
				L	T	P	Internal	External	Credits
1	CSE 461	Project work, seminar and internship in industry	Major Project	0	0	0	50	100	8
2	CSE 462	Seminar	Seminar	0	0	0	50	0	2
3	CSE 463	MOOCs	MOOC	0	0	0	100	0	2
Total Credits									12

ACHARYA NAGARJUNA UNIVERSITY
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ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (AI&ML)
III/IVB.TECH-SEMESTER I

S. No	Course Details		Category	Scheme of Instruction			Scheme of Examination		Credits
	Code	Subject Name		Hours in a Week			Marks		
				L	T	P	Internal	External	
1	AM 311	Knowledge Representation & Reasoning	PC	4	1	0	30	70	3
2	AM 312	Machine Learning	PC	4	1	0	30	70	3
3	AM 313	Database Management System	PC	4	1	0	30	70	3
4	AM 314	Job Elective – 1	JE-1	4	1	0	30	70	3
5	AM 315	Professional Elective-1	PE-1	4	1	0	30	70	3
6	AM 351	ML LAB	PC	0	0	3	30	70	1.5
7	AM 352	DBMS LAB	PC	0	0	3	30	70	1.5
8	AM 353	JE-1 LAB	JE-1 Lab	0	0	3	30	70	1
9	AM 354	Statistics Using R	SOC	0	0	3	30	--	1
10	AM 355	Internship Program					100		1
Total Credits									**21**
Internship 2 months (Mandatory) during Summer vacation									
Honors/Minor Courses (The hours distribution can be 3-0-2 or 3-1-0 also)									**4**

JE-1 (Lab Oriented):
  AM 314 A. Natural Language Processing
  AM 314 B. Soft Computing
  AM 314 C. Computer Vision
  AM 314 D. Digital Image Processing
PE-1:
  AM 315 A. Expert Systems
  AM 315 B. Cognitive Science & Analysis
  AM 315 C. Human Computer Interaction
  AM 315 D. Computer Networks

ACHARYA NAGARJUNA UNIVERSITY
SCHEME OF INSTRUCTION AND EXAMINATION
w.e.f. 2023-2024 R20 Syllabus
ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (AI&ML)
III/IVB.TECH-SEMESTER II

S. No	Code	Subject Name	Category	L	T	P	Internal	External	Credits
		Course Details		Scheme of Instruction			Scheme of Examination		
				Hours in a Week			Marks		
1	AM 321	Data Science	PC	4	1	0	30	70	3
2	AM 322	Artificial Neural Networks	PC	4	1	0	30	70	3
3	AM/CS 323	Web Technologies	PC	4	1	0	30	70	3
4	AM 324	Job Elective – 2	JE-2	4	1	0	30	70	3
5	AM 325	Professional Elective-2	PE-2	4	1	0	30	70	3
6	AM 326	Constitution of India	MC	3	0	0	30	70	0
6	AM 361	Data Science LAB	PC	0	0	3	30	70	1.5
7	AM/CS 362	WT LAB	PC	0	0	3	30	70	1.5
8	AM 363	JE-2 LAB	JE-2 Lab	0	0	3	30	70	1
9	AM 364	Power Bi	SOC	0	0	3	30	70	1
Total Credits									**20**
Internship 2 months (Mandatory) during Summer vacation									
Honors/Minor Courses (The hours distribution can be 3-0-2 or 3-1-0 also)									**4**

JE-2 (Lab Oriented):
    AM 324 A. Data Visualization
    AM 324 B. Block chain Technology
    AM 324 C. Cryptography and Network Security
    AM 324 D. Advanced DataBases
PE-2:
    AM 325 A. Mobile Computing
    AM 325 B. Cloud Computing Architecture And Its Application
    AM 325 C. Quantum Computing
    AM 325 D. Industry 4.0

AM 311	Knowledge Representation & Reasoning

Course Objectives:

1. To investigate the key concepts of knowledge representation (KR) techniques and different notations.

2. To integrate the KR view as a knowledge engineering approach to model organizational Knowledge.

3. To introduce the study of ontologies as a KR paradigm and applications of ontologies.

4. To understand various KR techniques.

5. To understand process, knowledge acquisition and sharing of ontology.

Course Outcomes:

- Analyze and design knowledge based systems intended for computer implementation.
- Acquire theoretical knowledge about principles for logic-based representation and reasoning.
- Ability to understand knowledge-engineering process
- Ability to implement production systems, frames, inheritance systems and approaches to handle uncertain or incomplete knowledge..

UNIT - I:

The Key Concepts: Knowledge, Representation, Reasoning, Why knowledge representation and reasoning, Role of logic

Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, Unity Amidst diversity

UNIT - II:

Ontology: Ontological categories, Philosophical background, Top-level categories, Describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time

UNIT - III:

Knowledge Representations: Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation

UNIT - IV:

Processes: Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, **Constraint satisfaction**,

Change Contexts: Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts.

UNIT - V:

Knowledge Soup: Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic, Fuzzy logic, Nonmonotonic Logic, Theories, Models and the world, Semiotics Knowledge Acquisition and Sharing: Sharing Ontologies, Conceptual schema, Accommodating multiple paradigms, Relating different knowledge representations, Language patterns,

TEXT BOOKS:

1. Knowledge Representation logical, Philosophical, and Computational Foundations by John F. Sowa, Thomson Learning.
2. Knowledge Representation and Reasoning by Ronald J. Brachman, Hector J. Levesque, Elsevier.

Reference books

- Schank, Roger C., Robert P. Abelson: Scripts, Plans, Goals, and Understanding: An Inquiry into Human Knowledge Structures. Hillsdale, NJ: Lawrence Erlbaum, 1977.
- R. C. Schank and C. K. Riesbeck: Inside Computer Understanding: Five Programs Plus Miniatures, Lawrence Erlbaum, 1981.
- Murray Shanahan: A Circumscriptive Calculus of Events. Artif. Intell. 77(2), pp. 249-284, 1995.
- Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education (India),2013 .

AM 312	Machine Learning

COURSE OBJECTIVES:

The students will be able to :

1. Introduce the basic concepts and techniques of machine learning and the need for Machine learning techniques for real world problem.
2. To provide understanding of various Machine learning algorithms and the way to evaluate the performance of ML algorithms.
3. To learn, predicte and classify the real world problems.
4. To understand, learn and design simple artificial neural networks for the selected problem
5. To understand mathematical models or techniques

UNIT-1 INTRODUCTION

Well-posed learning problems, Concept learning andthegeneraltospecificordering,find-S:findingamaximallyspecifichypothesis,versionspaces--candidate elimination algorithm, inductivebias.

Decision Tree Learning–decision tree representation, appropriate problems fordecision tree learning, hypothesis space search in decisiontreelearning, inductive bias indecision treelearning, issues indecision treelearning.

UNIT-2

SupervisedLearning:–Regression:LinearRegression,multilinearregression,PolynomialRegression, logistic regression, Non-linear Regression, Model evaluation methods.

UNIT-3

Instance-Based Learning- Introduction, k-nearest neighbour algorithm, locally weighted regression,radialbasis functions, case-basedreasoning,remarks on lazy andeager learning.

Bayesian learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Bayes optimal classifier, Gibbs algorithm, NaïveBayesclassifier,Bayesian belief networks,EM algorithm

UNIT-4

Artificial Neural Networks - **Artificial Neural Networks-1**– Introduction, neural network representation,appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagationalgorithm, Anillustrativeexample:facerecognition.

UNIT-5

Hidden Markov Models: Introduction, discrete Markov processes, hidden Markov models, three basicproblems of HMMs evaluation problem, finding the state sequence, learning model parameters,modelselectioninHMM.

Text Books

1. Tom M. Mitchell, Machine Learning, McGraw Hill , 2017.
2. EthemAlpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press, 2015

References

1. AurelienGeron, Hands-On Machine Learning WithScikit-Learn and Tensorflow, O'Reallypublication 2019 .
2. ShaiShalev-Shwartz and Shai Ben-David, Understanding Machine Learning, Cambridge University Press. 2017 .
3. T. Hastie, R. Tibshirani, J. H. Friedman, Introduction to Statistical Machine Learning 1/e, Springer, 2017.
4. M NarasimhaMurty, Introduction to Pattern Recognition and Machine Learning, World Scientific Publishing Company, 2015 .

Course Outcomes:

1. Be able to recognize the basic concepts techniques and the need for Machinelearning techniques for solving real world problems.
2. To illustrate the use of supervised learning algorithms
3. Apply classification techniques to make good predictions
4. To understand, learn and design simple artificial neural networks for the selected problem
5. Illustrate the relation between a sequence of observations and a sequence of hidden classes or hidden states that explain the observations.

AM 313	DBMS

Objectives of the course
- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
- To understand and use data manipulation language to query, update, and manage a database
- To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency & Client/Server (Database Server).
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS.

UNIT-I
Introduction - General introduction to database systems; Database - DBMS distinction, approaches to building a database, data models, database management system, three-schema architecture of a database, challenges in building a DBMS, various components of a DBMS.
E/R Model - Conceptual data modeling - motivation, entities, entity types, various types of attributes, relationships, relationship types, E/R diagram notation, examples.

UNIT II
Relational Data Model and Calculus: Relational algebra, Tuple and domain relational calculus.
SQL Concepts: Basics of SQL, DDL, DML, DCL, structure –creation, alteration, defining Constraints –Primary key, foreign key, unique, not null, check, IN operator, aggregate Functions, Built-in functions –numeric, date, string functions, set operations, sub-queries, Correlated sub-queries, joins.

UNIT III
Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.
Dependencies and Normal forms: Importance of a good schema design, problems encountered with bad schema designs, motivation for normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, multi-valued dependencies and 4NF, join dependencies and definition of 5NF.

UNIT IV
Storage strategies: Indices, B+-trees, hashing.
Transaction processing and Recovery:Concepts of Transaction processing, Concurrency control, ACID properties, Serializability of scheduling, Locking and timestamp-based schedulers and Recovery methods

UNIT V
PL/SQL Concepts: Cursors, Stored Procedures, Stored Functions, Database Triggers
Advanced Topics: Object oriented and object relational databases, Logical databases.

Text books:
1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S.Sudarshan, McGraw-Hill.
2. "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education.

Reference books
1. "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.
2. "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley.
3. "An introduction to Database Systems", C J Date, Pearson.
4. "Modern Database Management", Hoffer , Ramesh, Topi, Pearson.
5. "Principles of Database and Knowledge –Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.

Course Outcomes
- For a given query write relational algebra expressions for that query and optimize the developed expressions.
- For a given specification of the requirement design the databases using E-R method an normalization.
- For a given specification construct the SQL queries for Open source and Commercial DBMS, ORACLE.
- For a given query optimize its execution using Query optimization algorithms.
- For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.
- Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.

AM 314 A	**Natural Language Processing**

COURSE OBJECTIVES:
1. Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.
2. To understand linguistic phenomena and learn to model them with formal grammars.
3. To Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems.
4. To learn how to manipulate probabilities, construct statistical models over strings and trees
5. To estimate parameters using supervised and unsupervised training methods.
6. To design, implement, and analyze NLP algorithms. Able to design different language modeling Techniques.

UNIT – I:

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches.

UNIT – II:

Lexical syntax: Hidden Markov Models (Forward and Viterbi algorithms and EM training). Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues.

UNIT – III:

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT – IV:

Predicate-Argument Structure, Meaning Representation Systems, Software.

Discourse Processing: Cohesion, Reference Resolution, Discourse Cohesion and Structure.

UNIT – V:

Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross lingual Language Modeling.

TEXT BOOKS:
1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, PearsonPublication.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

REFERENCE BOOKS:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.

COURSE OUTCOMES:

1. Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
2. Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems.
3. Able to manipulate probabilities, construct statistical models overstrings and trees
4. Will be able to estimate parameters using supervised and unsupervised training methods.
5. Able to design, implement, and analyze NLP algorithms. Able to design different language modeling Techniques.

AM 314 B	Soft Computing

Course Objectives:

1. Soft computing refers to principle components like fuzzy logic, neural networks and genetic algorithm, which have their roots in Artificial Intelligence.

2. Healthy integration of all these techniques has resulted in extending the capabilities of the technologies to more effective and efficient problem solving methodologies

Course Outcomes: At the end of this course student will:

- Demonstrate Fuzzy set theory
- Interpret fuzzy systems
- Apply ANN Back propagation algorithm for classification
- Apply ANN training algorithms for solving real world problems
- Explain fundamentals and operators of Genetic Algorithm.

UNIT I : INTRODUCTION

Artificial neural network: Introduction, characteristics- learning methods – taxonomy – Evolution of neural networks- basic models – important technologies – applications.

Fuzzy logic: Introduction – crisp sets- fuzzy sets – crisp relations and fuzzy relations: Cartesian product of relation – classical relation, fuzzy relations, tolerance and equivalence relations, non-iterative fuzzy sets.

UNIT II : NEURAL NETWORKS

McCulloch-Pitts neuron – linear separability – hebb network – supervised learning network: perceptron networks – adaptive linear neuron, multiple adaptive linear neuron, BPN, RBF, TDNN-associative memory network: auto-associative memory network, hetero-associative memory network, BAM, Hopfield networks, iterative autoassociative memory network & iterative associative memory network –unsupervised learning networks: Kohonen self-organizing feature maps, LVQ – CP networks, ART network.

UNIT III : FUZZY LOGIC

Membership functions: features, fuzzification, methods of membership value assignments-Defuzzification: lambda cuts – methods – fuzzy arithmetic and fuzzy measures: fuzzy arithmetic – extension principle – fuzzy measures – measures of fuzziness -fuzzy integrals – fuzzy rule base and approximate reasoning : truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning-fuzzy inference systems-overview of fuzzy expert system-fuzzy decision making.

UNIT IV : GENETIC ALGORITHM

Genetic algorithm- Introduction – biological background – traditional optimization and search techniques – Genetic basic concepts.

Genetic algorithm and search space – general genetic algorithm – operators – Generational cycle – stopping condition – constraints – classification – genetic programming – multilevel optimization – real life problem- advances in GA

UNIT V

HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS .

Neuro-fuzzy hybrid systems – genetic neuro hybrid systems – genetic fuzzy hybrid and fuzzy genetic hybrid systems – simplified fuzzy ARTMAP – Applications: A fusion approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft computing based hybrid fuzzy controllers.

Text Books:

1. Principles of Soft Computing, S.N. Deepa S.N. Sivanandam**,** 2ed - Wiley India
2. Foundations of Neural Networks, Fuzzy Systems, and Knowldge Engineering, Nikola K. Kasabov, MIT Press, 1998
3. Neural Networks, Fuzzy Logis and Genetic Algorithms : Synthesis, and Applications, S. Rajasekaran, and G. A. Vijayalakshmi Pai, Prentice Hall of India, 2007

AM 314 C	**Computer Vision**

Objectives:
- Computer Vision focuses on development of algorithms and techniques to analyze and interpret the visible world around us.
- This requires understanding of the fundamental concepts related to multi-dimensional signal processing, feature extraction, pattern analysis visual geometric modeling, stochastic optimization etc.
- Knowledge of these concepts is necessary in this field, to explore and contribute to research and further developments in the field of computer vision.
- Applications range from Biometrics, Medical diagnosis, document processing, mining of visual content, to surveillance, advanced rendering etc.

UNIT - I
Recognition Methodology: Conditioning, Labeling, Grouping, Extracting, and Matching. Edge detection, Gradient based operators, Morphological operators, Spatial operators for edge detection. Thinning, Region growing, region shrinking, Labeling of connected components.

Binary Machine Vision: Thresholding, Segmentation, Connected component labeling, Hierarchal segmentation, Spatial clustering, Split & merge, Rule-based Segmentation, Motionbased segmentation.

UNIT - II
Area Extraction: Concepts, Data-structures, Edge, Line-Linking, Hough transform, Line fitting, Curve fitting (Least-square fitting).
Region Analysis: Region properties, External points, Spatial moments, Mixed spatial gray-level moments, Boundary analysis: Signature properties, Shape numbers.

UNIT - III
Facet Model Recognition: Labeling lines, Understanding line drawings, Classification of shapes by labeling of edges, Recognition of shapes, consisting labeling problem, Back-tracking, Perspective Projective geometry, Inverse perspective Projection, Photogrammetry.
From 2D to 3D, Image matching : Intensity matching of ID signals, Matching of 2D image, Hierarchical image matching.
Object Models and Matching: 2D representation, Global vs. Local features.

UNIT - IV
General Frame Works For Matching: Distance relational approach, Ordered structural matching, View class matching, Models database organization.
General Frame Works: Distance .relational approach, Ordered .Structural matching, View class matching, Models database organization.
Knowledge Based Vision: Knowledge representation, Control-strategies, Information Integration.

UNIT-V
Image Segmentation Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection.
Pattern Analysis Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA; Non-parametric methods.

OUTCOMES:

Upon completion of this course, the students should be able to:
- Implement fundamental image processing techniques required for computer vision.
- Perform shape analysis.
- Implement boundary tracking techniques.
- Apply chain codes and other region descriptors.
- Apply Hough Transform for line, circle, and ellipse detections.
- Apply 3D vision techniques.
- Implement motion related techniques.
- Develop applications using computer vision techniques.

References:
1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003
3. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
4. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006
5. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison- Wesley, 1992
6. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990

AM 314 D	Digital Image Processing

Course Objectives:
1. To study the image fundamentals and mathematical transforms necessary for image processing.
2. To study the image enhancement techniques
3. To study image restoration procedures.
4. To study the image compression procedures.

UNIT – I
Digital image fundamentals:
Introduction: Digital Image- Steps of Digital Image Processing Systems-Elements of Visual Perception - Connectivity and Relations between Pixels. Simple Operations- Arithmetic, Logical, Geometric Operations.
Mathematical Preliminaries - 2D Linear Space Invariant Systems - 2D Convolution - Correlation 2D Random Sequence - 2D Spectrum.

UNIT – II
Image transforms and enhancement: Image Transforms: 2D Orthogonal and Unitary Transforms-Properties and Examples. 2D DFT- FFT – DCT-Hadamard Transform - Haar Transform - Slant Transform - KL Transform -Properties AndExamples.ImageEnhancement:- Histogram Equalization Technique- Point Processing-Spatial Filtering-In Space AndFrequency -Nonlinear Filtering-Use Of Different Masks.

Unit – III
Image restoration and construction:
Image Restoration: Image Observation and Degradation Model, Circulant And Block Circulant Matrices and Its Application In Degradation Model - Algebraic Approach to Restoration- Inverse By Wiener Filtering – Generalized Inverse-SVD And Interactive Methods - Blind Deconvolution-Image Reconstruction From Projections.

Unit – IV
Image compression & segmentation
Image Compression: Redundancy And Compression Models -Loss Less And Lossy. CSE 314 D
Digital Image Processing Loss Less- Variable-Length, Huffman, Arithmetic Coding - Bit-Plane Coding, Loss Less Predictive Coding, Lossy Transform (DCT) Based Coding, JPEG Standard - Sub Band Coding. Image Segmentation: Edge Detection - Line Detection - Curve Detection - Edge Linking And Boundary Extraction, Boundary Representation, Region Representation And Segmentation, Morphology-Dilation, Erosion, Opening And Closing. Hit And Miss Algorithms Feature Analysis

Unit – V
Color and multispectral image processing
Color Image-Processing Fundamentals, RGB Models, HSI Models, Relationship Between Different Models. Multispectral Image Analysis - Color Image Processing Three Dimensional Image Processing- Computerized Axial Tomography-Stereometry-Stereoscopic Image Display-Shaded Surface Display.

Reference Books:

1. Digital Image Processing, Gonzalez.R.C & Woods. R.E., 3/e, Pearson Education, 2008.
2. Digital Image Processing, Kenneth R Castleman, Pearson Education,1995.
3. Digital Image Procesing, S. Jayaraman, S. Esakkirajan, T. Veerakumar, McGraw Hill Education Pvt Ltd, NewDelhi,2009.
4. Fundamentals of Digital image Processing, Anil Jain.K, Prentice Hall of India, 1989.
5. Image Processing, Sid Ahmed, McGraw Hill, New York, 1995.

Course Outcomes:
1. Review the fundamental concepts of a digital image processing system.
2. Analyze images in the frequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image restoration.
4. Categorize various compression techniques.
5. Interpret Image compression standards.
6. Interpret image segmentation and representation technique.

AM 315 A	**Expert Systems**

Course Objectives:

- Understand the basic techniques of artificial intelligence.
- Understand the Non-monotonic reasoning and statistical reasoning.

Course Outcomes:

- Apply the basic techniques of artificial intelligence.
- Discuss the architecture of an expert system and its tools.
- Understand the importance of building an expert system
- Understand various problems with an expert system

UNIT- I

Introduction to Expert Systems, Architecture of expert systems, Representation and organization of knowledge, Basics characteristics, and types of problems handled by expert systems.

UNIT - II

Expert System Tools: Techniques of knowledge representations in expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems.

UNIT - III

Building an Expert System: Expert system development, Selection of the tool, Acquiring Knowledge, Building process.

UNIT IV

Problems with Expert Systems: Difficulties, common pitfalls in planning, dealing with domain experts,

difficulties during development.

UNIT V

How to select an appropriate problem, the stages in the development of an expert system, types of errors to expect in the development stages, the role of the knowledge engineer in the building of expert systems, the expected life cycle of an expert system, how to do a life cycle model.

TEXT BOOKS:

1. Elain Rich and Kevin Knight, "Artificial Intelligence" Tata McGraw-Hill, New Delhi,

2. Waterman D.A., "A Guide to Expert Systems",Addison Wesley Longman,

REFERENCE BOOKS:

1. Stuart Russel and other Peter Norvig, "Artificial Intelligence,V A Modern Approach," Prentice-Hall,

2. Patrick Henry Winston, "Artificial Intelligence", Addison Wesley,

3. Patterson, Artificial Intelligence & Expert System, Prentice Hall India,1999.

4. Hayes-Roth, Lenat, and Waterman: Building Expert Systems, Addison Wesley,

5. Weiss S.M. and Kulikowski C.A., "A Practical Guide to Designing Expert Systems¨, Rowman & Allanheld, New Jersey.

M 315 B	Cognitive Science & Analysis

COURSE OBJECTIVES: To know the theoretical background of cognition.

- To understand the link between cognition and computational intelligence.
- To explore probabilistic programming language.
- To study the computational inference models of cognition.
- To study the computational learning models of cognition.

COURSE OUTCOMES: At the end of this course, the students will be able to:

- Understand the underlying theory behind cognition.
- Connect to the cognition elements computationally.
- Implement mathematical functions through WebPPL.
- Develop applications using cognitive inference model.
- Develop applications using cognitive learning model.

UNIT I

PHILOSOPHY, PSYCHOLOGY AND NEUROSCIENCE

Philosophy: Mental-physical Relation – From Materialism to Mental Science – Logic and the Sciences of the Mind – Psychology: Place of Psychology within Cognitive Science – Science of Information Processing –Cognitive Neuroscience – Perception – Decision – Learning and Memory – Language Understanding and Processing.

UNIT II

COMPUTATIONAL INTELLIGENCE Machines and Cognition – Artificial Intelligence – Architectures of Cognition – Knowledge Based Systems – Logical Representation and Reasoning – Logical Decision Making –Learning – Language – Vision.

UNIT III

PROBABILISTIC PROGRAMMING LANGUAGE WebPPL Language – Syntax – Using Javascript Libraries – Manipulating probability types and distributions – Finding Inference – Exploring random computation – Coroutines: Functions that receive continuations –Enumeration

UNIT IV

INFERENCE MODELS OF COGNITION

Generative Models – Conditioning – Causal and statistical dependence – Conditional dependence – Data Analysis – Algorithms for Inference.

UNIT V

LEARNING MODELS OF COGNITION Learning as Conditional Inference – Learning with a Language of Thought – Hierarchical Models– Learning (Deep) Continuous Functions – Mixture Models

TEXT BOOK:

1. Vijay V Raghavan,Venkat N.Gudivada, VenuGovindaraju, C.R. Rao, Cognitive Computing: Theory and Applications: (Handbook of Statistics 35), Elsevier publications, 2016

 2. Judith Hurwitz, Marcia Kaufman, Adrian Bowles, Cognitive Computing and Big Data Analytics, Wiley Publications, 2015

 3. Robert A. Wilson, Frank C. Keil, "The MIT Encyclopedia of the Cognitive Sciences",The MIT Press, 1999.

4. Jose Luis Bermúdez, Cognitive Science -An Introduction to the Science of the Mind, Cambridge University Press 2020

REFERENCES:

1. Noah D. Goodman, Andreas Stuhlmuller, "The Design and Implementation of Probabilistic Programming Languages", Electronic version of book, https://dippl.org/.

 2. Noah D. Goodman, Joshua B. Tenenbaum, The ProbMods Contributors, "Probabilistic Models of Cognition", Second Edition, 2016, https://probmods.org/.

AM 315 C	Human Computer Interaction

Course Objectives:

1. Outline the importance of human computer interaction for a good design

2. Develop a GUI application for Understanding of Users.

3. Distinguish Online Vs Paper documentation in various development processes and social networking.

4. Analyze screen design of various applications in GUI and Web

5. Compare Device based and Screen based controls

6. Summarize effective feedback guidance and assistance

Course Outcomes

- Understand the importance of user interface and graphics-based systems.
- Plan screen designs which are fast and pleasing compositions to satisfy user needs
- Understand business functions and design standards or style guides
- Understand various screen components and determine the navigation of screens
- Summarize various screen devices and screen-based control components.

UNIT I

The User Interface: Introduction, Importance of the User Interface, Importance and benefits of Good Design, History of Human Computer Interface The Graphical User Interface: popularity of graphics, the concept of direct manipulation, .graphical system, Characteristics, Web user – Interface popularity, characteristics- .Principles of user interface.

UNIT II

The User Interface Design Process: Obstacles and Pitfall in the development Process, Usability, The Design Team, Human Interaction with Computers, Principles of User Interface .Design, Important Human Characteristics in Design, Human Consideration in Design

UNIT III

Understanding Business Functions: Business Definitions & Requirement analysis, Determining Business Functions, Design standards or Style Guides, System Training and Documentation

UNIT IV

Principles of Good Screen Design: Human considerations in screen Design, interface design. goals, test for a good design, Technological considerations in Interface Design. System Menus and Navigation Schemes: Structure, Functions, Context, Formatting, Phrasing .and Selecting, Navigating of Menus, Kinds of Graphical Menus. Windows Interface: .Windows characteristic, Components of Window, Windows Presentation Styles, Types of .Windows, Window Management, Web systems.

UNIT V

Device and Screen-Based Control: Device based controls, Operable Controls, Text entry/read-only Controls, Section Controls, Combining Entry/Selection Controls, Other Operable Controls and Presentation Controls, Selecting proper controls.

Text Books

- The Essential Guide to User Interface Design, Wilbert O. Galitz, Wiley India Edition
- Sharps Interaction Design, Prece, Rogers, Wiley India

Reference Books:

- Designing the user interfaces, Ben Shneidermann, 3rd Edition, Pearson Education Asia

- User Interface Design, Soren Lauesen, Pearson Education

- Essentials of Interaction Design, Alan Cooper, Robert Riemann, David Cronin

- Human Computer Interaction, Alan Dix, Janet Fincay, GreGoryd, Abowd, Russell, Bealg Pearson Education

AM 315 D	Computer Networks

Course Objectives:

At the end of the course, the students will be able to:
1. Build an understanding of the fundamental concepts of data communication and computer networking.
2. Understand how errors detected and corrected that occur in transmission
3. How collisions to be handled when many stations share a single channel
4. Know about routing mechanisms and different routing protocols
5. Understand transport layer functions
6. Know about different application layer protocols

UNIT I:
Introduction: Uses of Computer Networks, Network Hardware, LANs, MANs, WANs, Network Software.
Reference Models: The OSI Reference Model, TCP/IP Reference Model, the comparison of OSI, and TCP/IP reference models.
The Physical Layer: Guided transmission media: Magnetic Media, Twisted Pair, Coaxial Cable, and Fiber Optics.

UNIT II:
The Data Link Layer: Data link layer design issues, Error detection and correction, Elementary data link
protocols, and Sliding window protocols.
The Medium Access Control Sub layer: The channel allocation problem, multiple access protocols,
ETHERNET, and Wireless LANs.

UNIT III:
The Network Layer: Network Layer Design Issues, Routing Algorithms: Shortest Path, Flooding, DVR, and Link State routing algorithm, Congestion Control Algorithms, and Quality of Service. IP protocol and IP address.

UNIT – IV
The Transport Layer: The Transport Service, Elements of Transport Protocols, and the Internet Transport Protocols: UDP- Remote Procedure Call, The Real-Time Transport Protocol, TCP-Introduction to TCP, The TCP Service model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, TCP Connection Management Modeling, TCP Transmission Policy, Congestion Control, TCP Timer Management.

UNIT – V
Application Layer: The Domain Name System (DNS) – Resource Records, Name Servers, E-Mail Architecture and Services, POP3, IMAP, World Wide Web – Architectural Overview, Server side, Uniform Resource Locators, Statelessness and Cookies.

Reference Books:
1. Andrew S Tanenbaum, Computer Networks.4 ed, Pearson Education / PHI.
2. Behrouz A.Forouzan, Data Communications and Networking. 4 ed, TATA McGraw Hill
3. Kurose and Ross, Computer Networks – A Top-down Approach Featuring the Internet.'Pearson Education.

Course Outcomes:

After completing this course the student must demonstrate the knowledge and ability to:
1. Describe the basis and structure of an abstract layered protocol model
2. Independently understand basic computer network technology.
3. Identify the different types of network topologies and protocols.
4. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
5. Identify the different types of network devices and their functions within a network
6. Understand and building the skills of subnetting and routing mechanisms.
7. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation
8. Understand how the Internet works today.

AM 351	ML Lab

COURSE OBJECTIVES:

1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To become familiar with regression methods.
3. To implement classification methods.
4. To implement clustering methods.
5. To become familiar with Dimensionality reduction Techniques.

LIST OF EXPERIMENTS

1. a) Implementation of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
   b) Implementation of Python Libraries for ML application such as Pandas and Matplotlib.

2. a)Creation and Loading different datasets in Python
   b) Write a python program to compute Mean, Median, Mode, Variance, Standard Deviation using Datasets.

3. Write a python program to compute reshaping the data, Filtering the data , merging the data and handling the missing values in datasets.

4. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

5. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use a appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

6. Write a Python program to implement Simple Linear Regression and plot the graph.

7. Implementation of Logistic Regression for iris using skitlearn

8. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

9. implementation of naviebayes classifier algorithm and plot the graph.

10. a) Implementation of k-means clustering.

    b) Dimensionality reduction: Reducing the number of random variables to consider..

COURSE OUTCOMES:
1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To become familiar with regression methods.
3. To implement classification methods.
4. To implement clustering methods.
5. To become familiar with Dimensionality reduction Techniques.

AM 352	DBMS Lab

1. Learn the Data Definition Language (DDL) commands in RDBMS, Data Manipulation Language (DML) and Data Control Language (DCL)
2. Create table and insert sample data in tables.
3. Queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, Date Functions and Conversion Functions
4. Queries using Partial Matching operators (LIKE, %, _, *, ?) ,ASC-DESC ordering combinations Checking for Nulls and aggregate functions in SQL
5. Perform queries involving predicates LIKE, BETWEEN, IN etc.
6. Queries to Retrieve and Change Data: Select, Insert, Delete, and Update
7. Queries on Controlling Data: Commit, Rollback, and Save point
8. Queries for Creating, Dropping, and Altering Tables, Views, and Constraints
9. To apply the concept of Aggregating Data using Group functions
10. Queries using Group By, Order By, and Having Clauses
11. Queries on Multi-table queries (JOIN OPERATIONS) ,Simple joins (no INNER JOIN) Aliasing tables – Full/Partial name qualification ,Inner-joins (two and more (different) tables) ,Inner-recursive-joins (joining to itself) , Outer-joins (restrictions as part of the WHERE and ON clauses) ,Using where & having clauses and Correlated Sub-Queries
12. Nested queries: In, Not In Exists, Not Exists Dynamic relations (as part of SELECT, FROM, and WHERE clauses)
13. Set Oriented Operations: Union, Difference, Intersection, Division
14. PL/SQL Programming I: Programs using named and unnamed blocks, using SQL and Control Structures in PL/SQL, Programs using Cursors
15. PL/SQL Programming II: Creating stored procedures, functions and packages
16. Triggers and auditing triggers

OUTCOMES:
- Understand, appreciate and effectively explain the underlying concepts of database technologies
- Design and implement a database schema for a given problem-domain Normaliz a database
- Populate and query a database using SQL DML/DDL commands.
- Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS
- Programming PL/SQL including stored procedures, stored functions, cursors, packages

Text Books/Suggested Reading:
- Oracle: The Complete Reference by Oracle Press
- Nilesh Shah, "Database Systems Using Oracle", PHI, 2007.
- Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

List of Open Source Software/learning website:
- https://www.tutorialspoint.com/dbms/
- https://www.w3schools.com/sql/
- https://in.udacity.com/

AM 353 A	NLP Lab

1. To implement Preprocessing of Text (Tokenization, filtration, script validation, stop word removal,stemming)

2. To implement Morphological Analysis

3. To implement N-Gram Model.

4. To implement POS Tagging

5. To implement Chunking

6. To implement Named Entity Recognization

7. To implement Virtual Lab on word Generator

8. Mini Project

AM 353 B	Soft Computing Lab

1. Create a perceptron with appropriate no. of inputs and outputs. Train it using fixed increment learning algorithm until no change in weights is required. Output the final weights.

2 Create a simple ADALINE network with appropriate no. of input and output nodes. Train it using delta learning rule until no change in weights is required. Output the final weights.

3 Train the autocorrelation by given patterns: A1=(-1,1,-1,1), A2=(1,1,1,-1), A3=(-1, -1, - 1, 1). Test it using patterns: Ax=(-1,1,-1,1), Ay=(1,1,1,1), Az=(-1,-1,-1,-1).

4 Train the hetrocorrelator using multiple training encoding strategy for given patterns: A1= (000111001) B1= (010000111), A2= (111001110) B2= (100000001), A3= (110110101) B3= (101001010). Test it using pattern A2.

5 Implement Union, Intersection, Complement and Difference operations on fuzzy sets. Also create fuzzy relation by Cartesian product of any two fuzzy sets and perform maxmin composition on any two fuzzy relations.

6 Solve Greg Viot's fuzzy cruise controller using MATLAB Fuzzy logic toolbox.

7. Solve Air Conditioner Controller using MATLAB Fuzzy logic toolbox 8 Implement TSP using GA.
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Objectives:
- Learn about camera geometry.

- Learn to calibrate camera using OpenCV functions.

- Learn to obtain and save camera intrinsic and distortion parameters.

- Learn to undistort image from camera.

- Learn to perform pose estimation of a known object.

- You can use either C or C++ version. All functions shown in this document are C++ functions.

1. Write a program to find negative image of a gray scale image.

2. Write a program to convert given image into a binary image using Otsu's method.

3. Write a program to find connected components of an image using iterative algorithm.

4. Write a program to calculate basic shape properties like area, centroid, perimeter etc.

5. Write a program to perform binary morphological erosion on a given image.

6. Write a program to perform image enhancement.

7. Write a program to perform edge detection using Sobel edge detector.

8. Write a program to perform image smoothing using box filter.

9. Write a program to perform image smoothing using weighted average gaussian filter.

10. Write a program to perform image segmentation.

AM 353 D	Digital Image Processing Lab

1. Write a MATLAB program to extract different Attributes of an Image.

2. Write a MATLAB program for image enhancement

3. Write a MATLAB program for Image Negation.

4. Write a MATLAB program for image compression

5. Write a MATLAB program for colour image processing

6. Write a MATLAB program for image segmentation

7. Write a MATLAB program for image morphology

8. Write a MATLAB program for Image Restoration

9. Write a MATLAB program for Power Law Transformation.

10. Write a MATLAB program for Histogram Mapping and Equalization.

11. Write a MATLAB program for Image Smoothening and Sharpening.

12. Write a MATLAB program for Edge Detection using Sobel, Prewitt and Roberts

    Operators.

13. Write a MATLAB program for Morphological Operations on Binary Images.

14. Write a MATLAB program for Pseudo Colouring.

15. Write a MATLAB program for Chain Coding.

16. Write a MATLAB program for DCT/IDCT Computation.

List of practical's using R-programming
1. Correlation Coefficient
2. Regression Coefficient
3.Curve fitting
4.Graphs of pmf, pdfs and cdfs of discrete and continuous distributions
5.Estimation
6. Z test
7. t test
8. F test
9. χ^2 test
10.Interval Estimation

AM 321	Data Science

Course Objectives:

Will gain knowledge in the basic concepts of Data Analysis

- To acquire skills in data preparatory and pre-processing steps.
- To understand the mathematical skills in statistics.
- To learn the tools and packages in Python for data science.
- To gain understanding in classification and Regression Model.
- To acquire knowledge in data interpretation and visualization techniques.
- To learn the essential concepts of data analytics and data visualization.

UNIT I

Data science: definition, Datafication, Exploratory Data Analysis, The Data science process, A data scientist role in this process. NumPy Basics: The NumPy ndarray: A MultidimensionalArray Object, Creating ndarrays ,Data Types for ndarrays, Operations between Arrays and Scalars, Basic Indexing and Slicing, Boolean Indexing, Fancy Indexing, Data Processing Using Arrays, Expressing Conditional Logic as Array Operations, Methods for Boolean Arrays , Sorting , Unique.

UNIT II

Getting Started with pandas: Introduction to pandas, Library Architecture, Features, Applications, Data Structures, Series, DataFrame, Index Objects, Essential Functionality Reindexing, Dropping entries from an axis, Indexing, selection, and filtering), Sorting and ranking, Summarizing and Computing Descriptive Statistics, Unique Values, Value Counts, Handling Missing Data, filtering out missing data.

UNIT III

Data Loading, Storage, and File Formats: Reading and Writing Data in Text Format, Reading Text Files in Pieces, Writing Data Out to Text Format, Manually Working with Delimited Formats, JSON Data, XML and HTML: Web Scraping, Binary Data Formats, Using HDF5 Format, Reading Microsoft Excel Files, Interacting with Databases, Storing and LoadingData in MongoDB.

UNIT IV

Data wrangling: Combining and Merging Data Sets, Database style DataFrame Merges, Merging on Index, Concatenating Along an Axis, Combining Data with Overlap, Reshaping and Pivoting, Reshaping with Hierarchical Indexing, Data Transformation, Removing Duplicates, Replacing Values.

UNIT V

Plotting and Visualization: A Brief matplotlib API Primer, Figures and Subplots, Colors, Markers, and Line Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, Plotting Functions in pandas, Line Plots, Bar Plots, Histograms and Density Plots, Scatter Plots.

Text Books:

1. Wes McKinney, "Python for Data Analysis",O'REILLY, ISBN:978-1-449-31979-3, 1stedition, October 2012.

2. Rachel Schutt & O'neil, "Doing Data Science", O'REILLY, ISBN:978-1-449-35865-5, 1stedition, October 2013.

Reference Books:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media, 2015
2. Matt Harrison, "Learning the Pandas Library: Python Tools for Data Munging, Analysis,and Visualization , O'Reilly, 2016.

Course Outcomes:

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

• Apply principles of NumPy and Pandas to the analysis of data.

• Make use of various file formats in loading and storage of data.

• Identify and apply the need and importance of pre-processing techniques.

• Show the results and present them in a pictorial format

Course Objective:

- The main objective of this course is to provide the student with the basic understanding of neural networks fundamentals.

- Program the related algorithms and Design the required and related systems

Course Outcomes:

- Demonstrate ANN structure and activation Functions

- Define foundations and learning mechanisms and state-space concepts

- Identify structure and learning of perceptions

- Explain Feed forward, multi-layer feed forward networks and Back propagation algorithms

- Analyze Radial Basis Function Networks, Theor Regularization and RBF networks

UNIT-I

Introduction and ANN Structure, Biological neurons and artificial neurons. Model of an

ANN. Activation functions used in ANNs. Typical classes of network architectures.

UNIT-II

Mathematical Foundations and Learning mechanisms,Re-visiting vector and matrix algebra, State-space concepts, Concepts of optimization, Error-correction learning. Memory based learning, Hebbian learning. Competitive learning.

UNIT-III

Single layer perceptrons, Structure and learning of perceptrons, Pattern classifier, introduction and Bayes' classifiers, Perceptron as a pattern classifier, Perceptron convergence. Limitations of a perceptrons.

UNIT-IV

Feed forward ANN, Structures of Multi-layer feed forward networks. Back propagation algorithm, Back propagation - training and convergence, Functional approximation with back propagation. Practical and design issues of back propagation learning.

UNIT-V

Radial Basis Function Networks, Pattern separability and interpolation, Regularization Theory and RBF networks.RBF network design and training. Approximation properties of RBF.

Text Books:

1. Simon Haykin, "Neural Networks: A comprehensive foundation", Second Edition, Pearson Education Asia.

2. Satish Kumar, "Neural Networks: A classroom approach", Tata McGraw Hill, 2004.

Reference Books:

1. Robert J. Schalkoff, "Artificial Neural Networks", McGraw-Hill International Editions, 1997.

2. Artificial Neural Networks B. Yagna Narayana, PHI

3. Neural Networks Simon Haykin PHI

AM /CS 323	Web Technology

UNIT-I
Introduction to HTML and Java Script: Introduction to html, fundamentals of HTML elements, Document body, text, hyperlink, lists, tables, color and images, frames; Cascading Style Sheets: Introduction, defining your own styles, properties and values in styles, style sheets, formatting blocks, and layers;
JavaScript: JavaScript basics, variables, string manipulation, mathematical functions, statements, operators, arrays and functions

UNIT-II
Objects in JavaScript: Data and objects in JavaScript, regular expressions, exception handling, built-in objects, events; Dynamic HTML with JavaScript: Data validation, opening a new window, Rollover buttons, moving images, multiple pages in a single download, floating logos.
XML: Basics XML, document type definition, xml schemas, Document Object Model, presenting XML.

UNIT-III
Servlet: Lifecycle of a Servlet, a simple Servlet, the servlet API, the Javax.servlet package, reading Servlet parameters, the javax.servlet. HTTP package, Handling HTTP requests and responses, using cookies and sessions.
JSP: The anatomy of a JSP page, JSP processing, declarations, directives, expressions, code snippets, implicit objects, using beans in JSP pages, connecting to database in JSP.

UNIT-IV
Introduction to PHP: Basics of PHP, downloading, installing, configuring PHP, programming in a web environment and the anatomy of a PHP page; Overview of PHP data types and concepts: Variables and data types, operators, expressions and statements, strings, arrays and functions.

UNIT-V
PHP and database access: Basic database concepts, connecting to a MySQL database, retrieving and displaying results, modifying, updating and deleting data; MVC architecture: PHP and other web technologies: PHP and XML.

Text Books:

1. Chris Bates, "Web Programming: Building Internet Applications", Wiley DreamTech, 2nd Edition, 2002.

2. Jeffrey C K Jackson, "Web Technologies", Pearson Education, 1 st Edition, 2006.

3. Steven Holzner, "The Complete Reference PHP", Tata McGraw-Hill, 1st Edition, 2007

AM 324 A	DATA VISUALIZATION

Course Objectives:

1. Understand the visualization process and visual representations of data.

2. Learn visualization techniques for various types of data.

3. Explore the visualization techniques for graphs, trees, Networks.

4. Understand the visualization of maps, GIS and collaborative visualizations.

5. Discuss the recent trends in perception and visualization techniques.

Course Outcomes:

1. Apply the visualization process for creating visual representations.

2. Classify visualization techniques for different types of data.

3. Analyze visualization methods for graphs, trees, Networks.

4. Apply visualization techniques for GIS , maps and use collaborative visualization.

5. Summarize the recent trends in visualization techniques and their applications for real world problems.

UNIT I

Introduction to Visualization, Visualization process, visual representation of data, Gestalt principles, information overloads. Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

UNIT II

Introduction to Tableau Tableau Architecture, Tableau Server Architecture VizQL, introduction to Tableau Prep, Tableau Prep Builder User Interface, Data Preparation techniques using Tableau Prep Builder tool, Features of Tableau Desktop Connect to data from File and Database, Types of Connections, Joins and Unions, Data Blending, Tableau Desktop User Interface.

UNIT III

Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents. Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization.

UNIT IV

Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, Evaluating visualizations.

UNIT V

Recent trends in various perception techniques, various visualization techniques, data structures used in data visualization.

Text Books:

1. Matthew Ward Georges Grinstein Daniel Keim , Interactive Data Visualization: Foundations, Techniques, and Applications. A K Peters, Ltd. Natick.

2. E. Tufte, The Visual Display of Quantitative Information, GraphicsPress.

3. Joshua N. Milligan, Learning Tableau 2019 Tools for Business Intelligence, data prep, and visual analytics, Third edition.

Reference Books:

1. Data Visualization: A Handbook for Data Drive by AndyKirk

2. Hand book of data visualization ,chun-houh chen,wolfgang hardle,Antonyunwin

AM 324 B	BLOCK CHAIN TECHNOLOGY

Course Objectives:

- Develop familiarity of current technologies, tools.
- Impart strong technical understanding of Block Chain technologies.
- Explore the Smart Contracts and Ethereum implementation strategies.
- Introduce the current scenario and practical application areas of Hyper ledger.

UNIT-I

Block Chain 101- Distributed Systems, History of blockchain, Introduction to blockchain,Types of block chain, CAP theorem and blockchain, benefits and limitations of blockchain,

Decentralization-Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Blockchain and full eco system decentralization, Smart contract, Decentralized Organizations, Decentralized autonomous organizations, Decentralized autonomous corporations,Decentralized autonomous societies, Decentralized applications, Platforms for Decentralization.

UNIT-II

Cryptography and Technical Foundations- Introduction, Cryptographic primitives, Asymmetric Cryptography, Public and Private-keys, Financial -market and trading, Summary.

Bitcoin- Bitcoin, Transactions, Blockchain, Bitcoin Payments.

UNIT-III

Smart Contracts- History, Definition, RicardianContracts.

Ethereum 101-Introduction, Ethereumblockchain, Elements of the Ethereum block chain, Precompiled contracts, Accounts, Block, Ether, Messages, Mining, Clients and Wallets, Trading and investment, The Yellow paper, The Ethereum Network, Applications developed on Ethereum, Scalability and security issues.

UNIT-IV

Hyper Ledger- Projects, Hyperledger as a Protocol, Fabric, Hyperledger Fabric, Sawtooth lake, Corda,

UNIT-V

Alternative Block Chain- Block chains, Platforms.

Scalability and Other Challenges- Scalability, Privacy, Security,

Text books:

1. SeberriusJeffery,"Block Chain" 2nd Edition Publishers details 2015

References:

1. Narayanan, Bonneau, Felten, Miller and Goldfeder, "Bitcoin and Cryptocurrency Technologies – A Comprehensive Introduction", Princeton University Press.

2. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.

AM 324 C	CRYPTOGRAPHY & NETWORK SECURITY

Course Objectives:

- Understand various cryptographic algorithms and be familiar with public-key cryptography.
- Apply authentication functions for providing effective security.
- Analyse the application protocols to provide web security.
- Discuss the place of ethics in the information security area

UNIT I

Attacks on computers and computer security: Introduction, the need for security, security approaches,principles of security, types of security attacks, security services, security mechanism, a model fornetwork security; Cryptography concepts and techniques: Introduction, plain text and ciphertext,substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetrickey cryptography, steganography, key range and key size, possible types of attacks.

UNIT-II

Symmetric key ciphers: Block cipher principles and algorithms (DES, AES, Blowfish), differential andlinear cryptanalysis, block cipher modes of operation, stream ciphers, RC4 location, and placementofencryption function, key distribution; Asymmetric key ciphers: Principles of public key cryptosystems,algorithms (RSA Diffie - Hellman, ECC) key distribution.

UNIT III

Message authentication algorithm and hash functions: Authentication requirements, functions, message,authentication codes, hash functions, secure hash algorithm, whirlpool, HMAC, CMAC,digitalsignatures, knapsack algorithm.
Authentication application: Kerberos, X.509 authentication service, public – keyinfrastructure,biometric authentication

UNIT IV

E-mail Security: Pretty Good Privacy; S/MIME IP Security: IP security overview, IP security architecture, authentication header, encapsulating security payload, combining security associations,key management.

UNIT V

Web security: Web security considerations, secure socket layer and transport layer security, secureelectronic transaction intruders; Virus and firewalls: Intruders, intrusion detection passwordmanagement, virus and related threats, countermeasures, firewall design principles; Types offirewalls

Reference Books:

1. William Stallings, Cryptography and Network Security, Pearson Education, 2006

2. AtulKahate, "Cryptography and Network Security", McGraw-Hill, 2nd Edition, 2009.

3. C K Shymala, N Harini, Dr. T R Padmanabhan, "Cryptography and Network Security", WileyIndia, 1st Edition, 2016.
4. Behrouz A. ForouzanDedeepMukhopadhyay, "Cryptography and Network Security", McGrawHill, 2nd Edition, 2010.

5. Eric Cole, Dr. Ronald Kurtz and James W. Conley, Network Security Bible, Wiley Publishers, 2009

6. Jason Albanese and Wes Sonnenreich, Network Security Illustrated, MGH Publishers, 2003

COURSE OUTCOMES:

1. Understand the basic concepts on attacks of computer ,computer security.
2. Understand the concepts of symmetric key ciphers.
3. To describe about the message authentication algorithm and hash functions.
4. Understand the concepts of e-mail security.
5. Understand the concepts of web security

AM 324 D	ADVANCED DATABASES

OBJECTIVES:
- To understand the design of databases.

- To acquire knowledge on parallel and distributed databases and its applications.

- To study the usage and applications of Object Oriented and Intelligent databases.

- To understand the emerging databases like Mobile, XML, Cloud and Big Data

UNIT I

PARALLEL AND DISTRIBUTED DATABASES
Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures –
Parallel Systems- Distributed Systems.
Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism –
Design of Parallel Systems
Distributed Database Concepts: Distributed Data Storage – Distributed Transactions – Commit Protocols
–Concurrency Control   –Distributed   Query   Processing

UNIT II
INTELLIGENT DATABASES
Active Databases: Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy- Applications- Design Principles
for Active Rules.
Temporal Databases: Overview of Temporal Databases TSQL2- Deductive Databases-Recursive Queries in
SQL.
Spatial Databases: Spatial Data Types - Spatial Relationships - Spatial Data Structures- Spatial Access Methods
Spatial Database Implementation.

UNIT III
XML DATABASES
XML Databases: XML Data Model – DTD – XML Schema – XML Querying – Web Databases – Open
Database Connectivity.

UNIT IV
MOBILE DATABASES
Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location
Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit
Protocols

UNIT V
MULTIMEDIA DATABASES
Multidimensional Data Structures – Image Databases – Text / Document Databases – Video Databases – Audio
Databases – Multimedia Database Design.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, ―An Introduction to Database Systems‖, Eighth Edition, Pearson
Education, 2006.

2. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T.Snodgrass, V.S.Subrahmanian, Roberto Zicari, ―Advanced Database Systemsǁ, Morgan Kaufmann publishers,2006.

3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, ―Database System Conceptsǁ, Sixth Edition, McGraw Hill, 2011.

4. R. Elmasri, S.B. Navathe, ―Fundamentals of Database Systemsǁ, Sixth Edition, Pearson Education/Addison Wesley, 2010.

5. Vijay Kumar, ―Mobile Database Systemsǁ, John Wiley & Sons, 2006.

OUTCOMES:

Upon completion of this course, a students should be able:

- To develop skills on databases to optimize their performance in practice.

- To analyze each type of databases and its necessity

- To design faster algorithms in solving practical database problems

AM 325 A	MOBILE COMPUTING

Course objectives

1. To understand the basic concepts of mobile computing.
2. To learn the basics of mobile telecommunication system .
3. To be familiar with the network layer protocols and Ad-Hoc networks.
4. To know the basis of transport and application layer protocols.
5. To gain knowledge about different mobile platforms and application development.

UNIT-I

Introduction: Mobility of Bits and Bytes – Wireless-The Beginning – Mobile Computing – Dialogue Control– Networks – Middleware and Gateways – Application and Services (Contents) – Developing Mobile Computing Application s-Security in Mobile Computing – Standards-Why is it Necessary? – Standard Bodies – Players in the Wireless Space.

Mobile Computing Architecture: Internet-The Ubiquitous Network – Architecture for Mobile Computing – Three-Tier Architecture – Design Considerations for Mobile Computing – Mobile Computing through Internet – Making Existing Applications Mobile-Enabled.

Mobile Computing Through Telephony: Evolution of Telephony – Multiple Access Procedures – Mobile Computing through Telephone – Developing an IVR Application – Voice XML – Telephony Application Programming Interface (TAPI).

Emerging Technologies: Introduction – Bluetooth – Radio Frequency Identification (RFID), WiMAX –Mobile IP – IPv6 – Java Card.

UNIT-II

Global System for Mobile Communications (GSM): GSM Architecture – Entities – Call Routing in GSM –PLMN Interfaces – GSM Addresses and Identifiers – Network Aspects in GSM – GSM Frequency Allocation –Authentication and Security.

Short Message Service (SMS): Mobile Computing over SMS – SMS – Value Added Services through SMS –Accessing the SMS Bearer.

GPRS: Packet Data Network – Network Architecture – Network Operations – Data Services in GPRS –Applications for GPRS – Limitations – Billing and Charging.

Wireless Application Protocol (WAP): Introduction – WAP – MMS – GPRS Applications.

UNIT-III

CDMA and 3G: Introduction – Spread-Spectrum Technology – Is-95 – CDMA Vs GSM – Wireless Data – 3GNetworks & Applications

Wireless LAN: Introduction – Advantages – IEEE 802.11 Standards – Architecture – Mobility – Deploying –Mobile Ad Hoc Networks and Sensor Networks – Wireless LAN Security – Wi-Fi Vs 3G.

UNIT IV

Internet Networks and Interworking: Introduction – Fundamentals of Call Processing – Intelligence in the Networks – SS#7 Signalling – IN Conceptual Model – Soft switch – Programmable Networks –Technologies and Interfaces for IN.

Client Programming: Introduction – Moving Beyond the Desktop – A Peek under the Hood: Hardware Overview – Mobile Phones – PDA – Design Constraints in Applications for Handheld Devices.

UNIT-IV

Android OS

Wireless Devices with Windows CE: Introduction – Different Flavors of Windows CE – Windows CE Architecture – Windows CE Development Environment.

TEXT BOOKS:

1. Asoke K Talukder& Roopa R.Yavagal, "Mobile Computing – Technology Applications and Service Creation", TMH 2006.

REFERENCE BOOKS:

1. Uwe Hansmann, Lother Merk, Martin S.Nicklous, Thomas Staber, "*Principles of*

Computing", 2/e, Springer International Edition.

2. J.Schiller, "*Mobile communications*", Addison-Wesley, 2003

Course Outcomes:
At the end of the course, the student should be able to:
- Explain the basics of mobile telecommunication systems
- Illustrate the generations of telecommunication systems in wireless networks
- Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network
- Explain the functionality of Transport and Application layers
- Develop a mobile application using android/blackberry/ios/Windows SDK

AM 325 B	CLOUD COMPUTING ARCHITECTURE AND ITS APPLICATION

Unit-1: Introduction to Cloud Computing

Introduction ,Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Manjrasoft Aneka.

Unit-2: Virtualization and Cloud Computing Architecture

Introduction, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples Xen: Paravirtualization, VMware: Full Virtualization, Microsoft Hyper-V. Cloud Computing Architecture, Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition, Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy Organizational Aspects.

Unit-3: Cloud Application Platform

Aneka: Cloud Application Platform, Framework Overview, Anatomy of the Aneka Container, From the Ground Up: Platform Abstraction Layer, Fabric Services, foundation Services, Application Services, Building Aneka Clouds, Infrastructure Organization, Logical Organization, Private Cloud Deployment Mode, Public Cloud Deployment Mode, Hybrid Cloud Deployment Mode, Cloud Programming and Management, Aneka SDK, Management Tools

Unit-4: Concurrent and Data Intensive Computing

Thread Programming, Introducing Parallelism for Single Machine Computation, Programming Applications with Threads, What is a Thread?, Thread APIs, Techniques for Parallel Computation with Threads, Multithreading with Aneka, Introducing the Thread Programming Model, Aneka Thread vs. Common Threads, Programming Applications with Aneka Threads, Aneka Threads Application Model, Domain Decomposition: Matrix Multiplication, Functional Decomposition: Sine, Cosine, and Tangent.

High-Throughput Computing: Task Programming, Task Computing, Characterizing a Task, Computing Categories, Frameworks for Task Computing, Task-based Application Models, Embarrassingly Parallel Applications, Parameter Sweep Applications, MPI Applications, Workflow Applications with Task Dependencies, Aneka Task-Based Programming, Task Programming Model, Developing Applications with the Task Model, Developing Parameter Sweep Application, Managing Workflows.

UNIT-5:Data Intensive Computing and Cloud Platforms in Industry

Map-Reduce Programming, What is Data-Intensive Computing?, Characterizing Data-Intensive Computations, Challenges Ahead, Historical Perspective, Technologies for Data-Intensive Computing, Storage Systems, Programming Platforms, Aneka Map Reduce Programming, Introducing the Map Reduce Programming Model, Example Application.

Cloud Platforms in Industry, Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google AppEngine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance.

Reference Books:

1. RajkumarBuyya, Christian Vecchiola, and ThamaraiSelvi Mastering Cloud. Computing McGraw Hill Education.
2. Dan C. Marinescu, Cloud Computing Theory and Practice, Morgan Kaufmann, Elsevier 2013.

Course outcomes:

The students should be able to:

- Explain cloud computing, virtualization and classify services of cloud computing
- Illustrate architecture and programming in cloud
- Describe the platforms for development of cloud applications and List the application of cloud.

AM 325 C	QUANTUM COMPUTING

Course Objectives:

- To introduce the fundamentals of quantum computing
- The problem-solving approach using finite dimensional mathematics

Course Outcomes:

- Understand basics of quantum computing
- Understand physical implementation of Qubit
- Understand Quantum algorithms and their implementation
- Understand the Impact of Quantum Computing on Cryptography

UNIT - I

Introduction to Essential Linear Algebra: Some Basic Algebra, Matrix Math, Vectors and Vector Spaces, Set Theory

Complex Numbers: Definition of Complex Numbers, Algebra of Complex Numbers, Complex Numbers Graphically, Vector Representations of Complex Numbers, Pauli Matrice, Transcendental Numbers

UNIT - II

Basic Physics for Quantum Computing: The Journey to Quantum, Quantum Physics Essentials, Basic Atomic Structure, Hilbert Spaces, Uncertainty, Quantum States, Entanglement

Basic Quantum Theory: Further with Quantum Mechanics, Quantum Decoherence, Quantum Electrodynamics, Quantum Chromodynamics, Feynman Diagram Quantum Entanglement and QKD, Quantum Entanglement, Interpretation, QKE

UNIT - III

Quantum Architecture: Further with Qubits, Quantum Gates, More with Gates, Quantum Circuits, The D-Wave Quantum Architecture

Quantum Hardware: Qubits, How Many Qubits Are Needed? Addressing Decoherence, Topological Quantum Computing, Quantum Essentials

UNIT - IV

Quantum Algorithms: What Is an Algorithm? Deutsch's Algorithm, Deutsch-Jozsa Algorithm, Bernstein-Vazirani Algorithm, Simon's Algorithm, Shor's Algorithm, Grover's Algorithm

UNIT - V

Current Asymmetric Algorithms: RSA, Diffie-Hellman, Elliptic Curve The Impact of Quantum Computing on Cryptography: Asymmetric Cryptography, Specific Algorithms, Specific Applications

TEXT BOOKS:

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press

2. Dr. Chuck Easttom, Quantum Computing Fundamentals, Pearson

REFERENCE BOOKS:

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci.

2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. Basic Concepts, Vol.

3. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms.

AM 325 D	Industry 4.0

Course objectives:

- This course is designed to offer learners an introduction to Industry 4.0 (or the Industrial Internet), its applications in the business world.
- Learners will gain deep insights into how smartness is being harnessed from data and appreciate what needs to be done in order to overcome some of the challenges.

Unit-1:

Introduction to Industry 4.0 : The Various Industrial Revolutions, Digitalisation and the Networked Economy , Drivers, Enablers, Compelling Forces and Challenges for Industry 4.0, The Journey so far, Developments in USA, Europe, China and other countries, Comparison of Industry 4.0 Factory and Today's Factory, Trends of Industrial Big Data and Predictive Analytics for Smart Business Transformation, Summary

Unit-2:

Road to Industry 4.0:, Internet of Things (IoT) & Industrial Internet of Things (IIoT) & Internet of Services , Smart Manufacturing , Smart Devices and Products, Smart Logistics, Smart Cities, Predictive Analytics, Summary.

Unit- 3:

Related Disciplines, System, Technologies for enabling Industry 4.0: Cyberphysical Systems, Robotic Automation and Collaborative Robots, Support System for Industry 4.0, Mobile Computing , Related Disciplines, Cyber Security, Summary.

Unit- 4:

Role of data, information, knowledge and collaboration in future organizations: Resource-based view of a firm, Data as a new resource for organizations, Harnessing and sharing knowledge in organizations, Cloud Computing Basics, Cloud Computing and Industry 4.0, Summary.

Unit- 5:

Other Applications and Case Studies, Industry 4.0 laboratories, IIoT case studies, Case studies, Business issues in Industry 4.0: Opportunities and Challenges, Future of Works and Skills for Workers in the Industry, Era, Strategies for competing in an Industry 4.0 world, Summary

Course outcomes :

1. Understand the drivers and enablers of Industry 4.0
2. Appreciate the smartness in Smart Factories, Smart cities, smart products and smart services
3. Able to outline the various systems used in a manufacturing plant and their role in an Industry 4.0 world
4. Appreciate the power of Cloud Computing in a networked economy
5. Understand the opportunities, challenges brought about by Industry 4.0 and how organisations and individuals should prepare to reap the benefits

AM 326	Constitution of India

UNIT-I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT-IV

Local Administration - District's Administration Head - Role and Importance, Municipalities – Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: FunctionsPRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials – Importance of grass root democracy

UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

References Books:
1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. NewDelhi
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics 4
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-resources:
1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details

AM 361	DATA SCIENCE LAB

1. Work with Numpy arrays
2. Working with Pandas data frames
3. Develop python program for Basic plots using Matplotlib
4. Develop python program for Frequency distributions
5. Develop python program for Variability
6. Develop python program for Averages
7. Develop python program for Normal Curves
8. Develop python program for Correlation and scatter plots
9. Develop python program for Correlation coefficient
10. Develop python program for Simple Linear Regression

OBJECTIVES:
- Demonstrate the ability to retrieve data from a database and present it in a web page.
- Use FTP to transfer web pages to a server.
- Construct pages that meet, guidelines for efficient download and cater to the needs of an identified audience.
- Evaluate the functions of specific types of web pages in relationship to an entire web site.
- Create web pages that meet accessibility needs of those with physical disabilities and apply the effects of CSS in web page creation.
- To develop the PHP and Data access

1 INSTALLATIONS:
> Installation of XAMPP and WAMP servers

2 HTML
- a. Create a table to show your class time table.
- b. Use tables to provide layout to your HTML page describing your college infrastructure.
- c. Use and tags to provide a layout to the above page instead of a table layout.

3. HTML
- a. Use frames such that page is divided into 3 frames 20% on left to show contents of pages, 60% in centre to show body of page, remaining on right to show remarks.
- b. Embed Audio and Video into your HTML web page.

4. HTML
- a. Create a webpage with HTML describing your department use paragraph and list tags.
- b. Apply various colors to suitably distinguish key words , also apply font styling like italics, underline and two other fonts to words you find appropriate , also use header tags.
- c. Create links on the words e.g. ―Wi-Fi and ―LAN‖ to link them to Wikipedia pages.
- d. Insert an image and create a link such that clicking on image takes user to other page.
- e. Change the background color of the page; At the bottom create a link to take user to the top of the page.

5. HTML
- a. Design the following static web pages required for an online book store web site.
    - 1) HOME PAGE: The static home page must contain three frames.
      Top frame : Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below). Left frame : At least four links for navigation, which will display the catalogue of respective links. For e.g.: When you click the link "CSE" the catalogue for CSE Books should be displayed in the Right frame.
      Right frame: The pages to the links in the left frame must be loaded here. Initially this page contains description of the web site

Logo	Web Site Name			
<mark>Home</mark>	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Description of the Web Site			

Fig 1.1

2) LOGIN PAGE: This page looks like below:

Logo	Web Site Name			
Home	<mark>Login</mark>	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Login : [ ] Password: [ ] Submit Reset			

3)CATOLOGUE PAGE:
The catalogue page should contain the details of all the books available in the web site in a table.
The details should contain the following:
1. Snap shot of Cover Page.
2. Author Name.
3. Publisher.
4. Price.
5. Add to cart button.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE		Book : XML Bible Author : Winston Publication : Wiely	$ 40.5	Add to cart
ECE		Book : AI Author : S.Russel Publication : Princeton hall	$ 63	Add to cart
EEE		Book : Java 2 Author : Watson Publication : BPB publications	$ 35.5	Add to cart
CIVIL		: HTML in 24 hours Author : Sam Peter Publication : Sam publication	$ 50	Add to cart

4) CART PAGE**:**
The cart page contains the details about the books which are added to the cart.
The cart page should look like this:

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	**Book name** Java 2 XML bible **Total amount** - $130.5	**Price** $35.5 $40.5	**Quantity** 2 1	**Amount** $70 $40.5

5) REGISTRATION PAGE:
Create a ―*registration form* ―with the following fields
1) Name (Text field) 2) Password (password field)
3) E-mail id (text field)
4) Phone number (text field)
5) Sex (radio button)
6) Date of birth (3 select boxes)
7) Languages known (check boxes – English, Telugu, Hindi, Tamil)
8) Address (text area)

6. CASCADING STYLE SHEET

Write an HTML page that contains a selection box with a list of 5 countries, when the user selects a country, its capital should be printed next to the list; Add CSS to customize the properties of the font of the capital (color, bold and font size).

7. JAVASCRIPT
   a. Write a java script program to test the first character of a string is uppercase or not.
   b. Write a pattern that matches e-mail addresses.
   c. Write a java script function to print an integer with commas as thousands separators.

8. JAVASCRIPT
   a. Write a java script program to sort a list of elements using quick sort.
   b. Write a java script for loop that will iterate from 0 to 15 for each iteration, it will check if the current number is odd or even, and display a message to the screen.

9. JAVASCRIPT

   a. Write a java script program which compute, the average marks of the following studentsthenthis average is used to determine the corresponding grade.
   b. Write a java script program to sum the multiple s of 3 and 5 under 1000.
   c. To design the scientific calculator and make event for each button using java script.

10.Write an XML file which will display the Book information which includes the following:
1) Title of the book
2) Author Name
3) ISBN number
4) Publisher name
5) Edition
6) Price
Write a Document Type Definition (DTD) to validate the above XML file.
Display the XML file as follows.
The contents should be displayed in a table. The header of the table should be in colorGREY. And the Author names column should be displayed in one color and should be capitalized and in bold. Use your own colors for remaining columns.
Use XML schemas XSL and CSS for the above purpose.

11.1) Install TOMCAT web server and APACHE.

While installation assign port number 4040 to TOMCAT and 8080 to APACHE. Make sure that these ports are available i.e., no other process is using this port.
2) Access the above developed static web pages for books web site, using these servers by putting the web pages developed in week-1 and week-2 in the document root.

Access the pages by using the urls : http://localhost:4040/rama/books.html (for tomcat)
http://localhost:8080/books.html (for Apache)

12.Develop and demonstrate PHP Script for the following problems:

a. Write a PHP Script to find out the Sum of the Individual Digits.
b. Write a PHP Script to check whether the given number is Palindrome or not
c. Write PHP program to convert a string, lower to upper case and upper case to lower case or capitalcase.
d. Write PHP program to change image automatically using switch case.
e. Write PHP program to calculate current age without using any pre-define function.
f. Write PHP program to upload image to the server using html and PHP.

13. Implement the following web applications using
(a) PHP
(b) Servlets
(c) JSP

14. Implement the web applications with Database using
(a) PHP, (b) Servlets and (c) JSP.

15. Modify the above PHP program to use an xml instead of database

16. Write a program to design a simple calculator using
(a) JavaScript (b) PHP (c) Servlet and (d) JSP.

Reference Books:
1. Uttam K Roy, ―Web Technologies‖, Oxford University Press, 1st Edition, 2010.
2. Steven Holzner, ―The Complete Reference PHP‖, Tata McGraw-Hill, 1st Edition, 2007
3. HTML Black Book – Steve Holzner.
4. The complete Reference Java 2 Fifth Edition by Patrick Naughton and Herbert Schildt. TMH
5. Java Server Pages –Hans Bergsten, SPD O'Reilly

AM363 A	Data Visualization Lab

Course Objectives:

1. Make more effective visualizations for data.

2. Understand how fundamental principles of design and human cognition inform effective visualizations.

3. Utilize popular visualization applications such as Tableau and Excel.

4. Develop web pages that allow others to interact with data.

5. Create visualizations using interactive web graphics programming in SVG format, java script, and D3.js.

Course Outcomes:

1. Demonstrate knowledge of technical advances through active participation in life-long

2. Discuss concepts and principles of data visualization particularly related to decision making.

3. Investigate technologies and practices for visualizing data as part of a data management and analytics system

4. Conduct research relevant data visualization topics

5. Use existing visualization tools and techniques to analyze basic datasets.

TASK1

Defining data visualization; Visualization workflow: describing data visualization workflow, process in practice.

TASK2 Experiment Data Representation: chart types: categorical, hierarchical, relational, temporal & spatial;

TASK 3 2-D experiments: bar charts, Clustered bar charts, dot plots, connected dot plots, pictograms, proportional shape charts, bubble charts, radar charts, polar charts, Range chart, Box-andwhisker plots, univariate scatter plots, histograms word cloud, pie chart, waffle chart, stacked bar chart, back-to-back bar chart, tree map and all relevant 2-D charts.

TASK 4 Experiment: surfaces, contours, hidden surfaces, pm3d coloring, 3Dmapping;

TASK 5 Program on multi-dimensional data visualization;

TASK 6 Program on manifold visualization;

TASK 7

Program on graph data visualization;

TASK 8 Program Annotation;

Texts/References:

1. Andy Kirk, Data Visualization A Handbook for Data Driven Design, Sage Publications,2016

2. Philipp K. Janert, Gnuplot in Action, Understanding Data with Graphs, Manning Publications, 2010.

3. Sinan ozdemmir , "Principles of Data Science", PacketPublishers-2016

1. Understand block chain technology.

2. Develop block chain based solutions and write smart contract using Hyperledger Fabric and Ethereumframeworks

3. Build and deploy block chain application for on premise and cloud based architecture.

4. Integrate ideas from various domains and implement them using block chain technology in differentperspectives.

5. Able to do payment model using block chain applications.

6. Understand the security features in block chain technology and develop applications.

AM 363 C	CNS LAB

1. Write a C program that contains a string (char pointer) with a value \Hello World'. The program should XOR each character in this string with 0 and displays the result.

2. Write a C program that contains a string (char pointer) with a value \HelloWorld'. The program should AND or and XOR each character in this stringwith127and display the result

3. Write a Java program to perform encryption and decryption using the following algorithms:

a) CeaserCipher

b) SubstitutionCipher

c) HillCipher

4. Write a Java program to implement the DES algorithm logic

5. Write a C/JAVA program to implement the BlowFish algorithm logic

6. Using. Java.Cryptography, encrypt the text "Hello world" using BlowFish. Create your own key using Java key tool.

7. Write a Java program to implement RSA Algoithm

8. Implement the Diffie-Hellman Key Exchange mechanism using HTML and Java Script.
   Consider the end user as one of the parties(Alice)and the Java Script application as
   other party (bob).

9. Calculate the message digest of a text using the SHA-1algorithm in JAVA.

10. Calculate the message digest of a text using the SHA-1algorithm in JAVA.

AM 363 D	**ADVANCED DATABASES LAB**

1. Familiarization of the MySQL database – creation and manipulation of tables.
2. Analyze a given situation, develop an ER model and convert the ER model to Relational model.
3. Implement the database using MySQL and manipulate the tables using SQL commands
4. Course project topic selection, develop an ER model and converting ER model to a schemediagram.
5. Developing a data flow diagram for the problem specification.
6. Implementation of front end pages.
7. Implementation of server side pages and verifying the normalization.
8. Testing the constraints and project

AM 364	POWER Bi

1. Prepare Data in Power BI Desktop

2. Import historical Data in Power BI Desktop

3. Model Data in Power BI Desktop

4. Create DAX Calculations in Power BI Desktop

5. Design a Report in Power BI Desktop

6. Create a Power BI Dashboard

7. Perform Data Analysis in Power BI Desktop

Dr YSR ANU College of Engineering & Technology

ACHARYANAGARJUNAUNIVERSITY
SCHEME OF INSTRUCTION AND EXAMINATION
w.e.f. 2024-2025 R20 Syllabus
ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (AI&ML)
IV/IVB.TECH - SEMESTER I

S. No	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	SubjectName		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	AM/CSE411	Design of Deep Learning Networks	PC	4	1	0	30	70	3
2	AM 412	Reinforcement & Ensemble Learning	PC	4	1	0	30	70	3
3	AM 413	Predictive Analysis	PC	4	1	0	30	70	3
4	AM 414	Job Elective – 3	JE-1	4	1	0	30	70	3
5	AM /CSE415	Research Methodology	BS	4	1	0	30	70	3
6	AM/CS 416	Open Elective-1 (MOOCs)	OE-1	3	0	0	30	70	3
7	AM /CSE451	Tensor Flow	SC	0	0	3	30	70	2
8	AM /CSE452	Industrial / Research Internship (2 months) after 3rd year (to be evaluated during VII semester)	MC	0	0	0	100	0	3
									23
Total Credits									
Internship 2 months (Mandatory) during Summer vacation									
Honors/Minor Courses (The hours distribution can be 3-0-2 or 3-1-0 also)									**4**

	JOB ELECTIVE COURSE-III	OPEN ELECTIVE-1(MOOCS)
1	AM 414 A. SOCIAL NETWORK ANALYSIS	1.Digital Circuits
2	AM 414 B. Augment Reality & Virtual Reality	
3	AM 414 C. AI in Game Environment	
4	AM414D. Intelligent Robots and Drone Technology	

Dr YSR ANU College of Engineering & Technology

ACHARYA NAGARJUNA UNIVERSITY

SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f. 2020-2023 (R20)

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

IV/IV B.TECH - SEMESTER II (R20 Regulation - Structure & Syllabus)

S. No	Code	Subject Name	Category	L	T	P	Internal	External	Credits
		Course Details	Category	Scheme of Instruction — Hours in a Week			Scheme of Examination — Marks		
1	CSE 461	Project work, seminar and internship in industry	Major Project	0	0	0	50	100	8
2	CSE 462	Seminar	Seminar	0	0	0	50	0	2
3	CSE 463	MOOCs	MOOC	0	0	0	100	0	2
Total Credits									12