H.N.G. University, Patan
M.Sc.(C.A. & I.T.) SEMESTER - IX
EL- I : DSS with Artificial Intelligence

Unit : 1 [30%]

AI and Knowledge Based Decision Support

Artificial Intelligence: Concepts, Definitions, Fields, AI v/s Natural Intelligence

Problem Solving: Defining the Problem as State Space Search, Water-jug Problem, Production System , Problem Characteristics, Production System Characteristics.

Heuristic Search Techniques: Generate and Test, Hill Climbing, Best First Search, A* Algorithm, Problem Reduction, Constraint Satisfaction, Means - End Analysis.

Expert System: Types of Knowledge Based DSS, Basic Concepts of ES, Structure of ES, Type of ES, Development Life Cycle of ES, Problem Area's and Example Of ES, Advantages and Limitations of ES, ES and Internet/Intranet/Web.

Unit : 2 [25%]

Knowledge Representation and Knowledge Acquisition

Knowledge Representation: Introduction, Representation in logic and Other Schemas, Rules in Knowledge Representation, Multiple, Experimental and Uncertain Knowledge Representation, Knowledge Representation Techniques: Semantic Net, Frame, Script.

Knowledge Acquisition: KE Introduction, Scope Of Knowledge: Sources, Level and Categories, Difficulties in KA, Methods Of Knowledge Acquisition: Interview, Tracking Methods, Observation And Manual Methods, Expert Driven Method, RGA, Role Of Knowledge Engineer, Machine learning, KA from Multiple Experts ,V & V in Knowledge Base, Analyzing, coding, Documenting, Diagramming knowledge, Numerical and Documented KA, KA and Internet/Intranet.

Game Playing: The Minimax Search Procedure, Alpha - Beta Cutoffs.

Unit : 3 [30%]

Neural Network and Natural Language Processing

Neural Network: Machine Learning, Neural computing, Analogy, Fundamental NN, NN application Development, Data Collection and Preparation, Architecture, Back propagation Network, learning Algorithm, testing, Implementation ,Software and Hardware of NN, Benefits and Limitations, NN in ES,NN for Decision Support, Example Of NN.

Application of NN and AI: Overview, credit Approval, Bankruptcy Prediction with NN, Stock Market Prediction with NN, Integrated NN and ES, Genetic Algorithm, Optimization Algorithm, QR, Intelligent System Integration, Data mining and Knowledge Discovery.

Perception: Speech recognition, Vision, Action,

Natural Language Processing: Introduction, Phases of NLP, Syntactic Processing, Semantic Analysis, ATN (Augmented Transition Network)

Unit : 4 [15%]

Fuzzy Logic

Fuzzy Set: Introduction, Basic Types and Concepts, Basic Operation, Arithmetic and Relation, Fuzzy Decision Making

Text Books:
1 Decision Support System and Intelligent System
    Author: Efraim Turban and Jay E. Aronson, Pub: PHI.
2 Fuzzy Sets and Fuzzy Logic: Theory and Applications
    Author: GEORGE J. KLIR AND BO YUAN, Pub: Prentice Hall

Reference Books:
1 Principles of Artificial Intelligence and Expert System Development.
    Author: David W. Rolston, Pub: McGraw Hill Book Company
2 Artificial Intelligence - Author: Elaine rich, Kevin Knight, Pub: Tata McGraw Hill

Unit : 1 [25%]

The object Oriented Paradigm, Management of Object Oriented Software Projects, Object Oriented Analysis: Domain Analysis, Generic components of the Analysis Model, The A Process, The Object-Relationship Model, The Object-Behavior Model, Object Oriented Design: Design for Object Oriented Systems, The System Design Process, The Object Design Process, Design Patterns

Unit : 2 [25%]

Introduction to Web Engineering, Web Engineering team, Analysis for Web Application: Requirements Analysis for Web Apps, The Analysis Model for Web Apps, The content Model, The Interaction Model, The Functional Model, The Configuration Model, Relationship-Navigation Analysis, Design for We Apps: Design Issues for Web Engineering, The Web E-Design Pyramid, Web App Interface Design, Aesthetic Design, Content Design, Architecture Design, Navigation Design, Component level Design, Hypermedia Design Patterns, Object-Oriented Hypermedia Design Method

Unit : 3 [25%]

Introduction to UML, Classes, Advanced Classes, Relationships, Advanced Relationships, Interfaces, types, Roles, Packages, Class Diagram, Use-case Diagram

Unit : 4 [25%]

Interaction Diagram: Sequence Diagram, Collaboration Diagram, Forward and Reverse Engineering, Activity Diagram, State Chart Diagram, Patterns and Frameworks, Component Diagram, Deployment Diagram

Text Books:

1. Software Engineering By Roger S. Pressman Fifth Edition McGraw Hill Publications
2. Software Engineering By Roger S. Pressman Sixth Edition McGraw Hill Publications
3. The Unified Modeling Language User Guide By Booch, Rumbaugh, Jacobson Low Price Edition Publication

Reference Books:

1. Use Case Driven Object Modeling with UML, Doug Rosenberg
2. Object Oriented Software Engineering, Ivan Jacobson
3. Object Technology Application Development, Daniel Tkach and Richard Puttick

Unit : 1   **[25%]**

Introduction to wireless
History of Wireless Communications, Types, propagation modes Wireless network architecture, Applications, Security, Concerns and Standards, Benefits, Future. Evolution of mobile computing, What mobile users need, SOC and AOCclient, Mobile computing OS, Architecture for mobile computing, Three tier architecture, design considerations for mobile computing, mobile computing through internet, making existing applications Mobile-Enabled.

Unit : 2   **[25%]**

Wireless (Mobile) Technologies
Bluetooth, Radio frequency identification(Rfid) NFC, Wireless Broadband, Mobile IP : Introduction, Advertisement, Registration, TCP connections, two level addressing, abstract mobility management model, performance issue, Mobile transport layer: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, transaction oriented TCP. Global system for mobile communication, Global system for mobile communication, GSM architecture, GSM entities, call routing in GSM, PLMN interface, GSM addresses and identifiers, network aspects in GSM, GSM frequency allocation, authentication and security, Short message services, Mobile computing over SMS, value added services through SMS, accessing the SMS bearer

Unit : 3   **[20%]**

General packet radio service(GPRS)
GPRS and packet data network, GPRS network architecture, GPRS network operation, data services in GPRS, Applications of GPRS, Billing and charging in GPRS

Unit : 4   **[30%]**

Wireless Application Protocol(WAP) WAP,MMS,GPRS application CDMA and 3G
Spread-spectrum Technology, CDMA versus GSM, Wireless data, applications in 3G Wireless LAN, Wireless LANadvantages,IEEE802.11 standards ,Wireless LAN architecture, Mobility in Wireless LAN, Deploying Wireless LAN, Mobile ad hoc networks and sensor networks, wireless LAN security, WiFi v/s 3GVoice over Internet protocol and convergence, Voice over IP,H.323 framework for voice over IP,SIP, comparison between H.323 ad SIP, Real time protocols, convergence technologies, call routing, voice over IP applications, IMS, Security issues in mobile, security framework for mobile environment

Text Books:

1. Mobile Computing, Asoke K Telukder, Roopa R Yavagal, TMH
2. The complete reference J2ME, TMH
3. Programming for Mobile and Remote Computers, G. T. Thampi, dreamtech
4. Handbook of Wireless Networks and Mobile Computing, Ivan Stojmenovic ,Wiley

Reference Books:

1. Principles of Mobile Computing, - Hansmann, Merk, Nicklous and Stober, Springer
2. Mobile Communications, Jochen Schiller, Pearson
3. Mobile Computing, Raj Kamal, Oxford
4. Mobile Computing, Wandra & Wandra, Akshat Pub.
5. Android Wireless Application Development, Shane Conder, Lauren Darcey, Pearson
6. Professional Android 2 Application development, Reto Meier, Wrox, Wiley India

Unit : 1 **[25%]**

History of HCI
HCI Frameworks and Paradigms
Interaction Frameworks
Interaction design

Unit : 2 **[25%]**

Human abilities
HCI in the software process
Design process. Prototyping
Implementation Support

Unit : 3 **[25%]**

Evaluation techniques
Handling errors
Universal design
GOMS and other cognitive models

Unit : 4 **[25%]**

CogTool
Capturing requirements
Task analysis
Web Usability

Text Books:

1. Human-Computer Interaction (3rd ed.), by Alan Dix, Janet Finlay, Gregory Abowd, and Russell Beale, Prentice Hall, 2003
2. The Design of Everyday Things, by D.Norman. Basic Books, 2002

Reference Books:

1. Yvonne Rogers, Heken Sharp, & Jenny Preece Interaction Design: Beyond Human-Computer Interaction**.** 3rd Edition, John Wiley & Sons, Inc, 2011.

H.N.G. University, Patan
M.Sc.(C.A. & I.T.) SEMESTER - IX
EL - V : Compiler Design

Unit : 1 [20%]

Introduction to Advanced Topics: Review of compiler structure, Importance of code optimization, Structure of optimizing compilers, Informal Compiler Algorithm Notation (ICAN)

Unit : 2 [20%]

Symbol Table Structure: Storage Classes, visibility & Lifetimes, table attributes & entries, Local symbol table Management, Global symbol table structure, Storage binding & symbolic registers

Unit : 3 [20%]

Control-Flow Analysis, Data-Flow Analysis, Dependence Analysis and Dependence Graphs, Alias Analysis

Unit : 4 [20%]

Introduction to Optimization, Redundancy Elimination, Loop Optimizations, Procedure Optimizations

Unit : 5 [20%]

Case Studies of Compilers and Future Trends, Automatic construction of lexical analyser (LEX), LEX specification and features, Intermediate code generation using Y ACC, code generation from DAG's

Text Books:

1. Steven S. Muchnick: "Advanced Compiler Design and Implementation" Margan Kaufmann
2. Aho Ullaman Sethi "Complier Construction" Addittion Wesley

Reference Books:

1. Holob "Compiler Designing" TMH
2. D.M.Dhamdhere "Compiler Construction – Principles & Practice", Macmillan India Ltd.

Unit : 1   **[20%]**

Digital Image Fundamental
Elements of Digital Processing System, Vidicon and Digital camera Working Principles, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Image sampling and quantization, dither, Two Dimensional mathematical preliminaries, 2D transforms – DFT, DCT, KLT, SVD

Unit : 2   **[20%]**

Image Enhancement
Histogram Processing and specification techniques, Noise distributions, Spatial averaging, Directional smoothing, Median, Geometric Mean, Harmonic Mean, Contra harmonic mean filters, Homomorphic filtering, color image processing : color fundamentals, color models, Pseudo color image processing

Unit : 3   **[20%]**

Image Restoration and Reconstruction
Image Restoration – degradation model, Unconstrained Restoration, Language multiplier and constrained Restoration, Inverse filtering – removal or blur caused by uniform linear Motion, wiener filtering, Geometric transformation – Spatial transformation

Unit : 4   **[20%]**

Image Segmentation
Edge detection, Edge linking via Hough transform, Region based segmentation, Region Growing by pixel aggregation, Region splitting and merging, Morphological Image Processing : Erosion, dilation, opening, closing, Basic Morphological Algorithms : hole filling , connected components, thinning, skeletons

Unit : 5   **[20%]**

Image Compression
Fundamentals, Image Compression Models, Basic compression Methods: Huffman, Run Length Encoding, Shift codes, Arithmetic Coding, LZW coding, Vector quantization, Transform coding, JPEG Standard, MPEG

Text Books :

1 Rafael C. Gonzalez , Richard E. Woods , Digital Image Processing , Pearson (Second Edition) 2004
2 Anil K. Jain , Fundamental of Digital Image Processing , Pearson 2002

Reference Books :

1. Kenneth R. Castleman, Digital Image processing , Pearson 2006
2. Digital Image Processing Using MATLAB , Rafeal C. Gonzalez , Richard E. Woods, and Steven L. Eddins , Second Edition , Tata McGraw Hill Publication
3. Digital Image Processing , S Sridhar , Oxford University Press

Unit: 1   **[20%]**

A First Look at Embedded Systems:
Examples of Embedded Systems, Typical Hardware. Hardware Fundamentals for the Software Engineer. - Terminology, Gates, Other Basic Considerations, Timing Diagrams, Memory

Unit: 2   **[30%]**

Advanced Hardware Fundamentals:
Microprocessors, Buses, Direct Memory Access, Interrupts, Other Common Parts, Built-Ins on the Microprocessor, Conventions Used on Schematics. Interrupts. - Microprocessor Architecture, Interrupt Basics, The Shared-Data Problem, Interrupt Latency. Survey of Software Architectures. - Round-Robin, Round-Robin with Interrupts, Function-Queue-Scheduling Architecture, Real-Time Operating System Architecture, Selecting an Architecture

Unit: 3   **[20%]**

Introduction to Real-Time Operating Systems:
Tasks and Task States, Tasks and Data, Semaphores and Shared Data. More Operating System Services. - Message Queues, Mailboxes, and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment

Unit: 4   **[30%]**

Basic Design Using a Real-Time Operating System:
Overview, Principles, Encapsulating Semaphores and Queues, Hard Real-Time Scheduling Considerations. Saving Memory Space, Saving Power

Embedded Software Development Tools:
Host and Target Machines, Linker/Locators for Embedded Software,Getting Embedded Software into the Target System

Debugging Techniques:
Testing on Your Host Machine, Instruction Set Simulators, The assert Macro, Using Laboratory Tools

Text Books:

1. An Embedded Software Primer   By David E. Simon (Pearson Education)
2. Fundamentals of Embedded Software By Daniel W. Lewis Pearson Education)

Reference Books:

1. Embedded System Design By Frank Vahid / Tony Givargis (Wiley)
2. Embedded Linux By Craig Hollabaugh (Pearson Education)

Unit : 1 **[25%]**

Introduction to Asp.net MVC, MVC Pattern, MVC applied to Web Frameworks, MVC overview, Software requirement for Asp.net MVC, Installing Asp.net MVC, MVC Application Structure

Controllers: controller basics, home controller, creating new controllers, write action methods, parameters in controller actions

Views: purpose of views, view data and view bag strongly type view, view models, adding view

Razor view engine: what is Razor, code expressions, HTML Encoding, code blocks, Razor syntax, implicit code expression, explicit code expression, unencoded code expressions, code block, code block, combining text and markup, mixing code and plain text, code delimeter, calling generic method, lay outs, specify partial view

Unit : 2 **[30%]**

Models: modeling the music store

Scaffolding a store manager**:** what is scaffolding, empty controller, controller with empty read/write actions, API controller with empty read/write actions, controller with read/write actions and views, using entity framework, executing the scaffolding template, executing the scaffolding code, editing an album, model binding

Forms and HTML helpers: using Forms method, automatic encoding, inside HTML helpers, adding inputs, helpers models and view data, strongly type helpers, other input helpers, rendering helpers

Data Annotations and validation: annotating orders for validation, using validation annotations, looking behind annotations curtain, custom validation logic, display and edit annotations

Unit : 3 **[30%]**

Membership, Authorization and security: using authorize attribute to require login, using authorize attribute to require membership, extending roles and memberships, external login via oauth and opened, understanding security vectors in Web application

AJAX: Jquery, Jquery features, Jquery selectors, Jquery events, jquery and ajax, unobtrusive javascript, using jquery (custom script, placing custom script in sections, ajax helpers, client validation, beyond helpers, json and clientside validation

Unit : 4 **[15%]**

Routing: URL, introduction to routing, defining routes, name routes, MVC areas, catch-ALL parameter, multiple URL parameters in segment, stop routing handler and ignore route, how routes generate URLs, ambient route values, how routes tie your url to an action, custom route constraints

Text/Reference Books:

1. 1 Professional ASP.NET MVC 4, jon Galloway, phill hack, brad Wilson, k. scott allen
2. Pro ASP.NET MVC 4, adam freeman
3. ASP.NET MVC 4 with Web API, Jamie Kurtz
4. Professional ASP.NET Design Patterns, scott millett

Unit : 1 [25%]

Mathematical Preliminaries and Formal Languages
- Set Theory
- Complementation, Empty set, De Morgan's Laws, subset, proper subset, Disjoint set, Finite and Infinite set, Power set, Cartesian product
- Functions and Relations
- One to One Function, Onto Function, Many One Function, Into Function, Composition Function, Properties of Relation, Equivalence Relation, Closure of Relation
- Graphs and Trees
- Graphs, Undirected graph, Directed Graph, Degree, Tress, Strings, Basic Operation on String

Unit : 2 [25%]

Finite Automata
- Deterministic and Non- deterministic automata
- Finite automata
- Equivalence of D.F.A's and N.F.A.'s
- Finite State Machine
- Finite Automation
- Finite Automation with output
- Language acceptance
- Comparison method for Testing equivalence of two FA
- Reduction of Numbers of States in FA
- Application of finite automata with output

Unit : 3 [25%]

Regular Languages and Context Free Grammars
- Regular Set and Expressions
- Identity rules and Algebraic rules for Regular Expression
- Equivalence of Finite Automata with Regular Expression
- Regular Grammar
- Closure Properties of Regular sets
- Context Free Grammar
- Understanding the Language defined by Grammar
- Ambiguous Grammar
- Simplification of Grammar

Unit : 4 [25%]

Pushdown automata and Turing Machines
- Equivalence of Acceptance of Final state and Empty stack
- Type's of PDA's
- Equivalence of PDA's and CFG's
- Turing's Assumption
- Turing Machine as Computational Machine
- Techniques for Turing Machine Construction
- Types of Turing Machines
- Universal Turing Machine

Text Books :

1. Theory of Automata and Formal Languages, Second Edition By Anand Sharma
2. Formal Languages and Automata Theory by K V N Sunitha and N Kalyani

Reference Books :

1. Theory of Automata & Formal Languages (As per UPTU syllabus), By A.M.Natarajan, A. Tamilarasi, P. Balasubramany
2. Formal Languages & Automata Theory, By A.A.Puntambekar