Artificial Intelligence(AI) and Robotics

1. **Introduction** AI applications and AI techniques, Production systems, control strategies, reasoning – forward and backward chaining. Intelligent Agents: Definitions of a rational agent, reflex, model-based, goal-based, and utility-based agents, the environment in which a particular agent operates.

2. **Searching Techniques and Game Playing** Breadth first search, depth first search, iterative deepening, uniform cost search, hill climbing, simulated annealing, genetic algorithm search, heuristic search, Best first search, A* algorithm, AO* algorithm, Minimax and game tree, refining minimax.

3. **Knowledge Representation** First order predicate calculus, resolution, unification, natural deduction system, refutation, logic programming, PROLOG, semantic networks, frame system, value inheritance, conceptual dependency, Ontologies. Expert Systems-MYCIN, CLIPS,Expert system shell different types of uncertainty degree of belief and degree of truth, various probability computations – prior probability, conditional probability, probability axioms, probability distributions, and joint probability distributions, Bayes' rule, other approaches to modeling uncertainty such as Dampster-Shafer theory and fuzzy logic.

4. **Natural language agreasoning** component steps of communication, context between formal and natural languages in the context of grammar, parsing and semantics Readings, speech recognition

5. **Robotics** Definition of Robot, Sensing, Programming, Types of Automation – Hard and Flexible. Classification of Robots. Robot Arm,Types of Joints - Prismatic, Revolute, Ball and Socket Joints, Degree of Freedom, Classification Criterion – Cylindrical, Spherical, Articulated robots, Configuration Sink Construction, Function and Structure of Robots, Arms Structures, Mobility. Probe, Methods of Modelling, Normal Structure. Robot Controllers- Teaching Methods Control Levels actuators, Close loop and path control, Different methods of teaching, Joint and its inverse path recording, Cartesian motion, Joint interpolated motion, Robot Teaching MethodsTeach-in and Teach through sensors, Programming Methods- Programming in a task, Robot programming, Computing of Teaching and programming methods. Machine learning, Machine Vision.

Books Recommended:

1. S. Russell and P. Norvig, Artificial intelligence: A Modern Approach (2nd ed.), Pearson Education, 2006.
2. Elaine Rich and Kelvin Knight, Artificial Intelligence, Tata McGraw Hill, 2002.
3. Nils J Nilson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann Publishers Inc, San Fransisco, California, 2000.
4. A. J. Jazbi, Introduction to Artificial Intelligence, Prentice-hall of india, 2005
5. Charniak, Eugene, Mc Dermott, Introduction to Artificial intelligence and Expert Systems, Prentice Hall of India, 2004.
6. Nils J. Nilson, Principles of Artificial Intelligence, Narosa Publishing House.
7. W.F. Clocksin and C.S. Mellish, Programming in PROLOG, Narosa Publishing House.
8. Suroj Kaushik, Logic and Prolog Programming, New Age International Publisher.

SEMESTER - IV

ELEEC-01

Telecommunication-I

1. Microwave Components: Loops and Probes, Bends and corners, E-Plane Tee, H-Plane Tee, Magic Tee, Directional Coupler, Isolator and Circulator

2. Microwave Strip lines: Concept of MIC's and MMIC's Micro strip lines, Slot lines, Coplanar Strip lines – their Characteristics Impedance losses and Q-Factor

3. Microwave Communication: Advantages and disadvantages of Microwave Transmission, Loss in Free Space, Propagation of Microwave, Atmospheric effects on propagation, Fresnel Zone problem, Ground Reflection, Fading Sources, Detectors, Components, Antennas used in MW communication systems

4. Antenna: Linear Antenna Arrays, Directional properties, Folded Dipole Antenna, YAGI-UDA antenna, Parabolic Reflection antenna, feed mechanisms, Log-Periodic antenna, Helical Antenna.

5. Radar System: Elements of Radar Systems, Radar range equation, Performance Parameters, Pulse Radar, CW Radar, MTI Radar, Radar Beacons, Radar Displays, Duplexes, Aircrafts Landing System, Ground Control approach, and Instrument Landing Systems

Books Recommended:

1. Lias S Y, Microwave Devices and Circuits, PHI, N.D.
2. Sisodia and Raghuvansi, Microwave Circuits and Passive Devices, Wiely Eastern Pub. N.D.
3. Yariv A, Optical Electronics, Saunders College Pub. London
4. Gpra K C, Gurg R, Bahal I H , Micro Stripkines and Slotlines, Arted House Pub.
5. Edwards T C, Foundation of Micro Strip Circuits and Design
6. Gupta K C na d Singh Amarjeet, Microstripintegratedcircuit ,Wiely Eastern Pvt. Ltd. N.D.
7. Gandhi OP, Microwave Engineering and Application ,Pergamon Press.

SEMESTER - IV
ELEEC-01

191

Telecommunication-II

1. **Signal Analysis**/Discrete Signal Analysis – In Discrete Time System, Introduction to Z-Transform, Properties of Z-Transform, Inverse Z-Transform, Continuous Signal Analysis – Introduction to periodic and aperiodic signals, Fourier series of periodic functions, Fourier Transform and its properties.

2. **Fiber Optic Communication**/Fiber Optic Communication system, Fiber Optical Characteristics, Light Wave Fundamentals, Integrated optical wave guides, Optic fiber waveguides, Light sources, Light Detectors, Compilers and Converters, Distribution Network, and fiber components, Modulation Noise Detection, System Design, Introduction to non-linear optics

3. **Data Acquisition System**/Introduction, Resolution and Accuracy, Numbers of Channels, Sampling rates, Ratio metric Conversion, Logarithmic compression, Single Channel data acquisition system, Preamplifier and Filtering, Multi-channel data acquisition system, multiplexing of outputs of sample hold Multiplexing after A/D conversion, Multiplexing Low Level Data, Present Trend in Data acquisition.

4. **Signal Conditioning – Excitation Systems and Amplifiers**/Sample and hold Circuits, Multiplexers – TDM and FDM , MSI, ICS and Multiplexers, Design of High Order Multiplexer using low order multiplexers ICS, A/D conversion, Address decoders, Example of such ICS, Telemetry – AC telemetry, Modulation in telemetry, Pulse and Radio Telemetry, Signal recovery, signal averaging , Signal Conductance, Signal Coding, Data processing, Display and recording Technique in Biomedical systems, Role in telemetry in Biomedical system

5. **Digital Communication**/Introduction of Telecommunication, Power Spectral Density of Digital Modulation, Scalar and Vector communication over discrete memory less Channel, Coherent communication with wave forms, Non-Coherent communication with wave forms, Partially coherent communication with wave forms, Differentially coherent communication with wave form, Double differentially coherent communication with wave form, Communication over band limited channel, Demodulation and Detection of other digital modulation,Coded digital communication, block coded digital communication, Convolutional coded digital communication

Books recommended:

1. Digital Signal Processing S Subrahmanm A avduwa - Mc Graw Hill
2. Optical Fiber Communication – Gred Keiser – Mc Graw Hill
3. Digital Signal Processing - Sanjay Sharma – Katzon Books

Digital Communication

1. **Information Theory:** Introduction, Entropy, Redundancy, Channel Capacity, Hartley's law, Hartley-Shannon Law, Noise is an information carrying channel, Bandwidth, S/N ratio, Trade-off

2. **Noise:** Communication in Noisy Channels, Error rates in Binary Transmission, Optimum Signal Detection Levels, Information Capacity of PCM systems, Relations among Entropy, Noise and Bandwidth, Noise Power and Spectral properties of Noise

3. **Introduction to Digital Communication:** Digital Modulation Format, Coherent Binary Modulation techniques, coherent quadrature modulation techniques, non-coherent binary modulation techniques, comparison of binary and quaternary modulation techniques, M-ary modulation techniques, Power Bandwidth Efficiency, M-ary modulation formats viewed in the light of Channel Capacity Theorem, Effect of Inter symbol Interference, Bit Versus Symbol Error Probability, Synchronization, Applications

4. **Coding methods and Error control:** Baud rate, Bit rate, Line coding- unipolar, Nonpolar RZ, NRZ, Manchester coding- biphase coding- ASCII, EBCDIC and baudot code, Channel coding, Error, Causes of error and its effects, error detection & correction using parity, Hamming code

5. **Multiplexing and Multiple Access techniques:** Need of Multiplexing, TDM, FDM definition block diagram and their comparison, Introduction to WDM, Multiple Access techniques- TDMA, FDMA, CDMA, advantages of TDMA over FDMA

Books recommended:

1. Sanjay Sharma, Communication systems, Analog and Digital, S K Kataria and Sons
2. Wayne Tomasi, Electronic communication system, Pearson Education
3. Leeds E. Frenzil, Electronic Communication, Tata McGraw Hill
4. Roddy-Coolen, Communication System, Prentice Hall of India
5. Amitabha Bhattacharya, Digital Communication, Tata McGraw Hill
6. K. Sam. &Shanmugar, Digital & Analog Communication ,Jhonwiley& sons
7. B. Sklar, Digital Communication Fundamentals & Applications, Pearson Education
8. Simanlaykin, Digital Communication, Jhonwiley &sons
9. J.S. Chitode, Digital Communication Technical, Publication, Pune
10. Froeuzen, Data Communication Networking, Tata Mc-graw Hill

SEMESTER-04
ELEEC-01

21 |

Internet Applications

1. **Hyper Text Markup Language (HTML)**
   Basic HTML, The document body, Text, Hyperlinks, adding more formatting, using colour, images, Tables, Multimedia Objects, Frames, Forms – Toward Interactivity, The HTML Document head in detail, XHTML – An Evolutionary markup

2. **Cascading Style Sheets (CSS)**
   Introduction, Using Styles: Simple examples, defining your own styles, properties and values in styles, style sheets – worked example, formatting blocks of information, layers

3. **An Introduction to Javascript**
   What is dynamic HTML?, Javascript, Javascript – The basics, variables, string manipulation, mathematical functions, statement operators, arrays, functions

4. **Dynamic HTML with Javascript**
   Data validation, opening a new window, messages and confirmations, the status bar, writing to a different frame, rollover buttons, moving images, multiple images in a single download, a text-only open system, floating logos

5. **Introduction to PHP**
   PHP, Introducing PHP, Including PHP in a page, data types, program control, arrays, user-defined functions, built-in functions, regular expression, using files

Books recommended:

1. Web programming- Building INERNET applications- Chris Bates, third edition, Wiley Eastern.

2. Programming with Java –A primer- E Balagurusamy, TMH

SEMESTER – IV

ELEEC-01

121

Embedded Systems

1. **Introduction to Embedded Systems:** Embedded System overview, Design Challenge, Processor Technology, IC Design technology, Trade-off's Combinational and Sequential Digital logic, Custom single purpose processor design, RT level custom single purpose processor design, Optimizing custom single purpose Processors

2. **General Purpose Processors: Software:** Basic Architecture, Operation, Programmers View, Development Environment, ASIPs, Microprocessor Selection, General purpose processor design

3. **Standard Single Purpose Processors: Peripherals:** Timers, Counters and Watchdog Timer, UTART, Pulse Width Modulator, Counters – LCD, Keypad and Stepper Motor, A/D Converters, Real Time Clock

4. **Memory:** Write Ability and Storage Permanence, Common Memory Types, Composing Memory, Memory Hierarchy and Cache, Advanced RAM

5. **Interfacing:** Communication basics – processor Interfacing, I/O Addressing, Interfacing, Interrupt- processor Interfacing, Direct Memory Address, Arbitration, Multilevel Bus Architectures, Communication principles, Serial Protocol, Parallel Protocol, Wireless Protocol

Books recommended:

1. Embedded System Design   Vahid &George
2. Embedded Systems   Rajkamal, TMH
3. An Embedded Software Primer   Simon, Pearson

R. Kumar
30.3.19

CPD
14/6/15

1. **Mechanics of Speech production** Mechanism of speech production, Acoustic phonetics – Digitalmodels for speech signals – Representations of speech waveform: Sampling speechsignals, basics of quantization, delta modulation, and Differential PCM – Auditoryperception: psycho acoustics – Digitalmodels for speech signal – Representations of speech waveform: Sampling speechsignals, basics of quantization, delta modulation, and Differential PCM – Auditoryperception: psycho acoustics.

2. **Time Domain Methods for Speech Processing**Time domain parameters of Speech signal, Methods for extracting the parameters: Energy, Average Magnitude, Zero crossing Rate – Silence Discrimination using ZCRand energy – Short Time, Auto Correlation Function – Pitch period estimation using Auto Correlation Function.

3. **Frequency Domain Method for Speech Processing**Short Time Fourier analysis: Fourier transform and linear filtering interpretations,Sampling rates – Spectrographic displays – Pitch and formant extraction – Analysis bySynthesis – Analysis synthesis systems: Phase vocoder, Channel Vocoder –Homomorphic speech analysis: Cepstral analysis of Speech, Formant and Pitch Estimation, Homomorphicvocoders.

4. **Linear Predictive Analysis of Speech** Basic Principles of linear predictive analysis – Auto correlation method – Covariancemethod – Solution of LPC equations – Cholesky method,Durbi's Recursive algorithm – Application of LPC parameters – Pitch detection using LPC parameters – Formantanalysis – VELP – CELP.

5. **Application of Speech & Audio Signal Processing** Speech signal enhancement, speech subtraction,Algorithms: Dynamic time warping, Knnann filtering and formant tracking,Hidden Markov modelling –Automatic Speech Recognition Feature Extraction for ASR, Deterministic sequence recognition,Statistical Sequencerecognition, Language models – Speaker identification and verification – Voice responsesystem – Speech synthesis, Basics of articulatory, source-filter, and concatenative synthesis, speech signal segmentation, basics of music signal processing.

Books Recommended:

1. Thomas F. Quatieri, Discrete-Time Speech Signal Processing, Prentice Hall / Pearson Education, 2004.

2. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley and Sons Inc., Singapore, 2004

3. L.R Rabiner and R.W Schaffer – Digital Processing of Speech signals – Prentice Hall

4. L.R. Rabiner and B. H. Juang, Fundamentals of Speech Recognition, Prentice Hall.

5. J.R. Deller , Jr.J.G. Hansen and J.G. Proakis, Discrete Time Processing of Speech Signals, John Wiley, IEEE Press.

SEMESTER - IV

ELEEC 01

Computer Network and _Web Programming

1. **Computer network and data communication**:Introduction to Data communication, ISO 7-Layer model, Computer networks, Topologies, Protocol, Introduction to LAN, WAN.

   PL,SQL,Introduction to DBMS, PL/SQL Commands

2. **Introduction to C#**:Origin & Evolution of C#, Characteristics of C#, Applications of C#, .NET strategy, origin of .NET technology, .NET framework, common languages runtime framework based classes, user and program interface, .NET languages, NET approach

3. **Overview of C#**:Introduction, C# programming, namespaces, adding comments, main returning a value, using aliases for namespace classes, passing string objects to write line method, command line arguments, main with a class, providing interactive input, using mathematical functions, compile time errors, program structures, program coding style

4. **Literals, variables and data types**:Introduction, literals, variables, data types, value types, reference types, declaration of variables, initialization of variables, default values, constant values, scope of variables, Decision making with if statement, simple If statement, If...else statement, nesting of If...else statements and use of ladder, switch statement, looping-Introduction, while statement, do statement, for each statement, jumps in loop

Books recommended:

1. Data & Network Communications – Miller, Michael, Vikas Pub.
2. Microsoft SQL Server 2008 – Cameron and Hirachi Consulting – PHI
3. The complete reference Java – Herbert SchildT, TMH
4. The Java Handbook – Patrick Naughton, TMH
5. An Introduction to Web design + Programming – P S Wang &Sanda S Katila, Thomson India

1. **Introduction to nanotechnology**: Background to nanotechnology, types of nanotechnology and nanomachines, atomic structure, molecules and phases, surface and dimensional space- top down and bottom up. Molecular nanotechnology: Electron microscopes, scanning electron microscope, atomic force microscope, scanning tunnelling microscope

2. **Nanomaterials**: Types of nanomaterials-nanopowder, self-assembly nanofilms, nanofibers, nanosheets, nanopillars, nanodots, nanotweezers, synthesis-high temperature solid state reaction technique-ball milling, sol gel, hydrothermal technique, sintering technique and their types of nanostructured vapour deposition, pulsed laser deposition, application of nanomaterials, thin films

3. **Fundamentals of nanoelectronics**: Fundamentals of logic devices, transistors, dynamic properties, threshold gates, physical limits to computations, concept of logic devices- classification, two terminal devices, field effect devices, coulomb blockade devices, spintronics, quantum computing, Ultimate computation-power dissipation limit, dissipation in reversible computations, the ultimate computing

4. **Silicon MOSFET & Quantum transport devices**: Silicon MOSFET and Novel materials, fundamentals of MOSFET devices, scaling, SOI, novel dielectrics, metal- gate junctions, advanced MOSFET concept. Quantum transport devices based on resonant tunnelling, electron tunnelling, resonant tunnelling diodes, resonant tunnelling devices, single electron devices for logic applications

5. **Carbon Nanotube**: Carbon nanotubes, types of nanotubes, formation of nanotubes, assemblies, electronic properties, synthesis of carbon nanotubes, carbon nanotube interconnects, carbon nanotubes FETs, nanotube for memory applications, molecular electronics, electronics and contacts, functions, molecular electronic devices, first test system, simulation and circuit design, future applications, MEMS, Robots, RAM, Mass storage devices

Books recommended:

1. Nanotechnology: Basic Science and Emerging Technologies, Wilson, Kanangara, Smith, Simmons and Raguse, Chapman and Hall/CRC
2. Nanoelectronics and Information Technology: Advanced Electronic materials and Novel Devices, R Waser, Wiley - VCH
3. Nano: The essentials-Understanding Nanoscience and Nanotechnology, T Pradeep, TMH

26 |