DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHOOL OF ENGINEERING
GIET UNIVERSITY, GUNUPUR, RAYAGADA

Research Domain Course –I (Credit :-03)

(Select any one Course)

SEMISTER-1

CORSE:-1.1 FIBER OPTICS COMPONENTS AND DEVICES

CORSE:-1.2 DIGITAL IMAGE AND VIDEO PROCESSING

CORSE:-1.3 WIRELESS AND MOBILE COMMUNICATION

CORSE:-1.4 ANALOG & DIGITAL CMOS VLSI DESIGN

CORSE:-1.5 RF AND MICROWAVE CIRCUIT DESIGN

CORSE:-1.6 NANO-MATERIAL AND NANOTECHNOLOGY

CORSE:-17 EMBEDDED SYSTEM DESIGN

CORSE:-1.8 SOFT COMPUTING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
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GIET UNIVERSITY, GUNUPUR, RAYAGADA

Research Domain Course –II (Credit :-03)

(Select any one Course)

SEMISTER -2

CORSE:-2.1 OPTICAL NETWORKS

CORSE:-2.2 PATTERN RECOGNITION & MACHINE LEARNING

CORSE:-2.3 MIMO SYSTEM

CORSE:-2.4 LOW POWER DIGITAL VLSI DESIGN

CORSE:-2.5 ANTENNAS AND RADIATING SYSTEM

CORSE:-2.6 BIO-MEDICAL SIGNAL PROCESSING

CORSE:-2.7 INTERNET OF THINGS AND APPLICATION

CORSE:-2.8 MACHINE LEARNING SYSTEM

Research Domain Course –I (Credit :-03)

(Select any one Course)

SEMISTER-1

CORSE:-1.1 **FIBER OPTICS COMPONENTS AND DEVICES**

UNIT– I (8 hours)

Fibre-Optic Light Sources and Detectors Brief description on the principle of optical sources, Internal Quantum efficiency of LED, Modulation capability, Power-Bandwidth product, Laser diodes, Laser diode modes, Threshold conditions, Resonant frequencies, Laser diode structures, Single mode lasers, modulation of laser diodes.

UNIT – II (8 hours)

Brief description on the principle of optical detectors, photo detector noise, Noise sources, Signal-to-Noise ratio, Detector response time, Depletion layer photocurrent, Response time, Avalanche multiplication noise.

UNIT – III (11 hours)

Optical Fibre Connection Joint loss, Multi mode fibre joints, Singe mode fibre joints, Fibre splices, Fusion splices, Mechanical splices, Multiple splices, Fibre connectors, Cylindrical ferrule connectors, Biconical ferrule connectors, Double eccentric connectors, Duplex fibre connectors, Expanded beam connectors, Fibre couplers, Three port couplers, Four port couplers, Star couplers, WDM couplers.

UNIT – IV (12 hours)

Optical Amplification and Integrated Optics Optical amplifiers, Semiconductor laser amplifiers, Fibre amplifiers, Rare earth doped fibre amplifiers, Raman fibre amplifiers, Brillouin fibre amplifiers, Integrated optics, Integrated optical devices, Beam splitters, Directional couplers, switches, Modulators, Periodic structures for filters and injection lasers, Opto-electronic integration, Optical bistability and digital optics, Optical computation.

References:

1. G. Keiser, Optical Fibre Communications, Mc-Graw-Hill.

2. J. M.Senior, Optical Fibre Communications Principles and Practice, PHI.

CORSE:-1.2 **DIGITAL IMAGE AND VIDEO PROCESSING**

UNIT– I (8 hours)

Digital Image and Video Fundamentals Digital image and video fundamentals and formats, 2-D and 3-D sampling and aliasing, 2-D/3-D filtering, image decimation/interpolation, video sampling and interpolation, Basic image processing operations, Image Transforms Need for image transforms, DFT, DCT, Walsh, Hadamard transform, Haar transform, Wavelet transform.

UNIT– II (8 hours)

Image and Video Enhancement and Restoration Histogram, Point processing, filtering, image restoration, algorithms for 2-D motion estimation, change detection, motion-compensated filtering, frame rate conversion, deinterlacing, video resolution enhancement, Image and Video restoration (recovery).

UNIT– III (10 hours)

Image and Video Segmentation Discontinuity based segmentation- Line detection, edge detection, thresholding, Region based segmentation, Scene Change Detection, Spatiotemporal Change Detection, Motion Segmentation, Simultaneous Motion Estimation and Segmentation Semantic Video Object Segmentation, Morphological image processing.

UNIT– I V (10 hours)

Colour image Processing, Colour fundamentals, Colour models, Conversion of colour models, Pseudo colour image processing, Full colour processing

References:

1. Ed. Al Bovik ,"Handbook of Image and Video Processing", 2nd Edition, Academic Press, 2000.
2. J. W. Woods, "Multidimensional Signal, Image and Video Processing and Coding",2nd Edition, Academic Press, 2011.
3. Rafael C. Gonzalez and Richard E. Woods," Digital Image Processing", 3rd Edition, Prentice Hall, 2008.
4. A. M. Tekalp, "Digital Video Processing", 2nd Edition, Prentice Hall, 2015.
5. S. Shridhar, "Digital Image Processing", 2nd Edition, Oxford University Press, 2016.

CORSE:-1.3 **WIRELESS AND MOBILE COMMUNICATION**

UNIT– I (8 hours)

Cellular Communication Fundamentals: Cellular system design, Frequency reuse, cell splitting, handover concepts, Co channel and adjacent channel interference, interference reduction techniques and methods to improve cell coverage, Frequency management and channel assignment.GSM architecture and interfaces, GSM architecture details, GSM subsystems, GSM Logical Channels, Data Encryption in GSM, Mobility Management, Call Flows in GSM.2.5 G Standards: High speed Circuit Switched Data (HSCSD), General Packet Radio Service (GPRS), 2.75 G Standards: EDGE

UNIT– II (8 hours)

Spectral efficiency analysis based on calculations for multiple access technologies: TDMA, FDMA and CDMA, Comparison of these technologies based on their signal separation techniques, advantages, disadvantages and application areas. Wireless network planning (Link budget and power spectrum calculations)

UNIT– III (10 hours)

Mobile Radio Propagation: Large Scale Path Loss, Free Space Propagation Model, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering, Practical Link Budget Design using Path Loss Models, Outdoor Propagation Models, Indoor Propagation Models, Signal Penetration into Buildings. Small Scale Fading and Multipath Propagation, Impulse Response Model, Multipath Measurements, Parameters of Multipath channels, Types of Small Scale.

UNIT– IV (10 hours)

Fading: Time Delay Spread; Flat, Frequency selective, Doppler Spread; Fast and Slow fading. Equalization, Diversity: Equalizers in a communications receiver, Algorithms for adaptive equalization, diversity techniques, space, polarization, frequency diversity, Interleaving.

References:

1. V.K.Garg, J.E.Wilkes, “Principle and Application of GSM”, Pearson Education, 5th edition, 2008.
2. V.K.Garg, “IS-95 CDMA & CDMA 2000”, Pearson Education, 4th edition, 2009.
3. T.S.Rappaport, “Wireless Communications Principles and Practice”, 2nd edition, PHI,2002.
4. William C.Y.Lee, “Mobile Cellular Telecommunications Analog and Digital Systems”, 2nd edition, TMH, 1995.

CORSE:-1.4 **ANALOG & DIGITAL CMOS VLSI DESIGN**

UNIT– I (8 hours)

Review: Basic MOS structure and its static behavior, Quality metrics of a digital design: Cost, Functionality, Robustness, Power, and Delay, Stick diagram and Layout, Wire delay models. Inverter: Static CMOS inverter, Switching threshold and noise margin concepts and their evaluation, Dynamic behavior, Power consumption.

UNIT–I I (8 hours)

Physical design flow: Floor planning, Placement, Routing, CTS, Power analysis and IR drop estimation-static and dynamic, ESD protection-human body model, Machine model. Combinational logic: Static CMOS design, Logic effort, Ratioed logic, Pass transistor logic, Dynamic logic, Speed and power dissipation in dynamic logic, Cascading dynamic gates, CMOS transmission gate logic.

UNIT– III (10 hours)

Single Stage Amplifier: CS stage with resistance load, Divide connected load, Current source load, Triode load, CS stage with source degeneration, Source follower, Common gate stage, Cascade stage, Choice of device models. Differential Amplifiers: Basic difference pair, Common mode response, Differential pair with MOS loads, Gilbert cell.

UNIT– IV (10 hours)

Passive and active current mirrors: Basic current mirrors, Cascade mirrors, Active current mirrors. Frequency response of CS stage: Source follower, Common gate stage, Cascade stage and difference pair stage.

References:

1. J P Rabaey, A P Chandrakasan, B Nikolic, “Digital Integrated circuits: A design perspective”, Prentice Hall electronics and VLSI series, 2nd Edition.
2. Baker, Li, Boyce, “CMOS Circuit Design, Layout, and Simulation”, Wiley, 2nd Edition.
3. BehzadRazavi , “Design of Analog CMOS Integrated Circuits”, TMH, 2007.
4. Phillip E. Allen and Douglas R. Holberg, “CMOS Analog Circuit Design”, Oxford, 3rd Edition.
5. R J Baker, “CMOS circuit Design, Layout and Simulation”, IEEE Inc., 2008.
6. Kang, S. and Leblebici, Y., “CMOS Digital Integrated Circuits, Analysis and Design”, TMH, 3rdEdition.
7. Pucknell, D.A. and Eshraghian, K., “Basic VLSI Design”, PHI, 3rd Edition.

CORSE:-1.5 **RF AND MICROWAVE CIRCUIT DESIGN**

UNIT– I (8 hours)

Transmission Line Theory: Lumped element circuit model for transmission line, field analysis, Smith chart, quarter wave transformer, generator and load mismatch, impedance matching and tuning.

UNIT– II (8 hours)

Microwave Network Analysis: Impedance and equivalent voltage and current, Impedance and admittance matrix. The scattering matrix, transmission matrix, Signal flow graph.

UNIT– III (10 hours)

Microwave Components: Microwave resonators, Microwave filters, power dividers and directional couplers, Ferromagnetic devices and components.

UNIT– IV (12 hours)

Microwave Semiconductor Devices And Modeling: PIN diode, Tunnel diodes, Varactor diode, Schottky diode, IMPATT and TRAPATT devices, transferred electron devices, Microwave BJTs, GaAs FETs, low noise and power GaAs FETs, MESFET, MOSFET, HEMT

References:

1. Matthew M. Radmanesh, "Advanced RF & Microwave Circuit Design: The Ultimate Guide to Superior Design", AuthorHouse, 2009.
2. D.M.Pozar, " Microwave engineering" ,Wiley, 4th edition, 2011.
3. R.Ludwig and P.Bretchko, "R. F. Circuit Design", Pearson Education Inc, 2009.
4. G.D. Vendelin, A.M. Pavoi, U. L. Rohde, "Microwave Circuit Design Using Linear and Non Linear Techniques", John Wiley 1990.
5. S.Y. Liao, "Microwave circuit Analysis and Amplifier Design", Prentice Hall 1987.
6. Radmanesh, "RF and Microwave Electronics Illustrated" , Pearson Education, 2004.

CORSE:-1.6 **NANO-MATERIAL AND NANOTECHNOLOGY**

UNIT– I (8 hours)

Nanomaterials in one and higher dimensions

UNIT– II (8 hours)

Applications of one and higher dimension nano-materials

UNIT– III (8 hours)

Nano-lithography, micro electro-mechanical system (MEMS) and nano-phonics

UNIT– IV (10 hours)

Carbon Nanotubes – synthesis and applications, Interdisciplinary arena of nanotechnology

References:

1. Nanoscale Materials in Chemistry edited by Kenneth J. Klabunde and Ryan M. Richards, 2ndedn, John Wiley and Sons, 2009.
2. Nanocrystalline Materials by A I Gusev and A ARempel, Cambridge International Science Publishing, 1st Indian edition by Viva Books Pvt. Ltd. 2008.
3. Springer Handbook of Nanotechnology by Bharat Bhushan, Springer, 3rd edn, 2010.
4. Carbon Nanotubes: Synthesis, Characterization and Applications by Kamal K. Kar, Research Publishing Services; 1stedn, 2011, ISBN-13: 978-9810863975.

CORSE:-1.7 **EMBEDDED SYSTEM DESIGN**

UNIT– I (12 hours)

Introduction: Features of Embedded systems, Design matrices, Embedded system design flow, SOC and VLSI circuit. ARM: An advanced Micro Controller, Brief history, ARM pipeline, Instruction Set Architecture ISA: Registers, Data Processing Instructions, Data Transfer Instructions, Multiplications instructions, Software interrupt, Conditional execution, branch instruction, Swap instruction, THUMB instructions. FPGA.

UNIT– II (8 hours)

Devices and device drivers, I/O devices, Serial peripheral interfaces, IIC, RS232C, RS422, RS485, Universal serial bus, USB Interface, USB Connector IrDA, CAN, Bluetooth, ISA, PCI, PCI – X and advance busses, Device drivers. Real time operating system: Hard real time, firm real time, soft real time, Task periodicity: periodic task, sporadic task, aperiodic task, task scheduling, scheduling algorithms: clock driven scheduling, event driven scheduling.

UNIT– III (8 hours)

Software and programming concept: Processor selection for an embedded system, State chart, SDL, PetriNets, Unified Modeling Language (UML). Low power embedded system design: Dynamic power dissipation, Static power dissipation, Power reduction techniques, system level power management.

UNIT– IV (8 hours)

Hardware and software partitioning: K-L partitioning, Partitioning using genetic algorithm, particle swarm optimization, Functional partitioning and optimization: functional partitioning, high level optimizations. Hardware software co-simulations

References:

1. “Hardware software co-design of Embedded systems” By Ralf Niemann, Kulwer Academic.
2. “Embedded real time system programming” By Sriram V Iyer, Pankaj Gupta, TMH.
3. Embedded System Design ” by Santanu Chattopadhay, PHI
4. “Embedded system architecture, programming and design” By Raj Kamal, TMH

CORSE:-1.8 **SOFT COMPUTING**

UNIT– I (8 hours)

Introduction to soft computing and neural networks: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics.

UNIT– II (8 hours)

Fuzzy Logic: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

UNIT– III (10 hours)

Neural Networks: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks: Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks

UNIT– IV (10 hours)

Genetic Algorithms: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning: Machine Learning Approach to Knowledge Acquisition.

References:

1. Jyh:Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, Neuro:Fuzzy and Soft Computing, Prentice:Hall of India, 2003.
2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic:Theory and Applications, Prentice Hall, 1995.
3. Matlab Toolkit Manual

Research Domain Course –II (Credit :-03)

(Select any one)

SEMISTER -2

CORSE:-2.1 **OPTICAL NETWORKS**

UNIT– I (10 hours)

SONET/SDH: optical transport network, IP, routing and forwarding, multiprotocol label switching. WDM network elements: optical line terminals and amplifiers, optical add/drop multiplexers, OADM architectures, reconfigurable OADM, optical cross connects.

UNIT– II (8 hours)

Control and management: network management functions, optical layer services and interfacing, performance and fault management, configuration management, optical safety.

UNIT– III (10 hours)

Network Survivability: protection in SONET/SDH & client layer, optical layer protection schemes, WDM network design: LTD and RWA problems, dimensioning wavelength routing networks, statistical dimensioning models.

UNIT– IV (8 hours)

Access networks: Optical time division multiplexing, synchronization, header processing, buffering, burst switching, test beds, Introduction to PON, GPON, AON.

References:

1. Rajiv Ramaswami, Sivarajan, Sasaki, “Optical Networks: A Practical Perspective”, MK, Elsevier, 3 rd edition, 2010.
2. C. Siva Ram Murthy and Mohan Gurusamy, “WDM Optical Networks: Concepts Design, and Algorithms”, PHI, EEE, 2001.

CORSE:-2.2 **PATTERN RECOGNITION & MACHINE LEARNING**

UNIT– I (8 hours)

Introduction to Pattern Recognition: Problems, applications, design cycle, learning and adaptation, examples, Probability Distributions, Parametric Learning - Maximum likelihood and Bayesian Decision Theory- Bayes rule, discriminant functions, loss functions and Bayesian error analysis.

UNIT– II (10 hours)

Linear models: Linear Models for Regression, linear regression, logistic regression Linear Models for Classification, Neural Network: perceptron, multi-layer perceptron, back propagation algorithm, error surfaces, practical techniques for improving back propagation, additional networks and training methods, Adaboost, Deep Learning

UNIT– III (8 hours)

Linear discriminant functions - decision surfaces, two-category, multi-category, minimum squared error procedures, the Ho-Kashyap procedures, linear programming algorithms, Support vector machine

UNIT– IV (8 hours)

Algorithm independent machine learning– lack of inherent superiority of any classifier, bias and variance, re-sampling for classifier design, combining classifiers

References:

1. Richard O. Duda, Peter E. Hart, David G. Stork, “Pattern Classification”, 2nd Edition John Wiley & Sons, 2001.
2. Trevor Hastie, Robert Tibshirani, Jerome H. Friedman, “The Elements of Statistical Learning”, 2nd Edition, Springer, 2009.
3. C. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2006.

CORSE:-2.3 **MIMO SYSTEM**

UNIT– I (8 hours)

Introduction to Multi-antenna Systems, Motivation, Types of multi-antenna systems, MIMO vs. multi-antenna systems

UNIT– II (10 hours)

Diversity, Exploiting multipath diversity, Transmit diversity, Space-time codes, The Alamouti scheme, Delay diversity, Cyclic delay diversity, Space-frequency codes, Receive diversity, The rake receiver, Combining techniques, Spatial Multiplexing, Spectral efficiency and capacity, Transmitting independent streams in parallel, Mathematical notation.

UNIT– III (10 hours)

The generic MIMO problem, Singular Value Decomposition, Eigenvalues and eigenvectors, Equalising MIMO systems, Disadvantages of equalising MIMO systems, Predistortion in MIMO systems, Disadvantages of pre-distortion in MIMO systems, Pre-coding and combining in MIMO systems, Advantages of pre-coding and combining, Disadvantages of precoding and combining, Channel state information.

UNIT– IV (8 hours)

Codebooks for MIMO, Beamforming, Beamforming principles, Increased spectrum efficiency, Interference cancellation, Switched beamformer, Adaptive beamformer, Narrowband beamformer, Wideband beamformer.

References:

1. Claude Oestges, Bruno Clerckx, "MIMO Wireless Communications: From Real-world Propagation to Space-time Code Design", Academic Press, 1st edition, 2010.
2. Mohinder Janakiraman, “Space - Time Codes and MIMO Systems”, Artech House Publishers, 2004.

CORSE:-2.4 **LOW POWER DIGITAL VLSI DESIGN**

UNIT– I (8 hours)

Technology & Circuit Design Levels: Sources of power dissipation in digital ICs, degree of freedom, recurring themes in low-power, emerging low power approaches, dynamic dissipation in CMOS, effects of V_{dd} & V_t on speed, constraints on V_t reduction, transistor sizing & optimal gate oxide thickness, impact of technology scaling, technology innovations.

UNIT– II (8 hours)

Low Power Circuit Techniques: Power consumption in circuits, flip-flops & latches, high capacitance nodes, energy recovery, reversible pipelines, high performance approaches.

UNIT– III (10 hours)

Logic Synthesis for Low Power estimation techniques: Power minimization techniques, low power arithmetic components- circuit design styles, adders, multipliers. Low Power Memory Design: Sources & reduction of power dissipation in memory subsystem, sources of power dissipation in DRAM &SRAM, low power DRAM circuits, low power SRAM circuits.

UNIT– IV (10 hours)

Low Power Microprocessor Design System: power management support, architectural trade offs for power, choosing the supply voltage, low-power clocking, implementation problem for low power, comparison of microprocessors for power & performance.

References:

1. P. Rashinkar, Paterson and L. Singh, “Low Power Design Methodologies”, Kluwer Academic, 2002
2. Kaushik Roy, Sharat Prasad, “Low power CMOS VLSI circuit design”, John Wiley sons Inc.,2000.
3. J. B. Kulo and J.H Lou, “Low voltage CMOS VLSI Circuits”, Wiley, 1999.
4. A. P. Chandrasekaran and R.W.Broadersen, “Low power digital CMOS design”, Kluwer,1995.
5. Gary Yeap, “Practical low power digital VLSI design”, Kluwer, 1998.

CORSE:-2.5 **ANTENNAS AND RADIATING SYSTEMS**

UNIT– I (10 hours)

Types of Antennas: Wire antennas, Aperture antennas, Micro strip antennas, Array antennas Reflector antennas, Lens antennas, Radiation Mechanism, Current distribution on thin wire antenna. Fundamental Parameters of Antennas: Radiation Pattern, Radiation Power Density, Radiation Intensity, Directivity, Gain, Antenna efficiency, Beam efficiency, Bandwidth, Polarization, Input Impedance, radiation efficiency, Antenna Vector effective length, Friis Transmission equation, Antenna Temperature.

UNIT– II (8 hours)

Linear Wire Antennas: Infinitesimal dipole, Small dipole, Region separation, Finite length dipole, half wave dipole, Ground effects. Loop Antennas: Small Circular loop, Circular Loop of constant current, Circular loop with non uniform current.

UNIT– III (8 hours)

Linear Arrays: Two element array, N Element array: Uniform Amplitude and spacing, Broadside and End fire array, Super directivity, Planar array, Design consideration.

UNIT– IV (10 hours)

Aperture Antennas: Huygen's Field Equivalence principle, radiation equations, Rectangular Aperture, Circular Aperture. Horn Antennas: E-Plane, H-plane Sectoral horns, Pyramidal and Conical horns. Micro strip Antennas: Basic Characteristics, Feeding mechanisms, Method of analysis, Rectangular Patch, Circular Patch.

References:

1. Constantine A. Balanis, "Antenna Theory Analysis and Design", John Wiley & Sons, 4th edition, 2016.
2. John D Kraus, Ronald J Marhefka, Ahmad S Khan, "Antennas for All Applications", Tata McGraw-Hill, 2002.
3. R.C.Johnson and H.Jasik, "Antenna Engineering hand book", Mc-Graw Hill, 1984.
4. I. J. Bhal and P. Bhartia, "Micro-strip antennas", Artech house, 1980.

CORSE:-2.6 **BIO-MEDICAL SIGNAL PROCESSING**

UNIT– I (8 hours)

Acquisition, Generation of Bio-signals, Origin of bio-signals, Types of bio-signals, Study of diagnostically significant bio-signal parameters.

UNIT– II (10 hours)

Electrodes for bio-physiological sensing and conditioning, Electrode-electrolyte interface, polarization, electrode skin interface and motion artefact, biomaterial used for electrode, Types of electrodes (body surface, internal, array of electrodes, microelectrodes), Practical aspects of using electrodes, Acquisition of bio-signals (signal conditioning) and Signal conversion (ADC's DAC's) Processing, Digital filtering.

UNIT– III (8 hours)

Biomedical signal processing by Fourier analysis, Biomedical signal processing by wavelet (time frequency) analysis, Analysis (Computation of signal parameters that are diagnostically significant)

UNIT– IV (10 hours)

Classification of signals and noise, Spectral analysis of deterministic, stationary random signals and non-stationary signals, Coherent treatment of various biomedical signal processing methods and applications

References:

1. W. J. Tompkins, "Biomedical Digital Signal Processing", Prentice Hall, 1993.
2. Eugene N Bruce, "Biomedical Signal Processing and Signal Modeling", John Wiley & Son's publication, 2001.
3. Myer Kutz, "Biomedical Engineering and Design Handbook, Volume I", McGraw Hill, 2009.
4. D C Reddy, "Biomedical Signal Processing", McGraw Hill, 2005.
5. Katarzyn J. Blinowska, JaroslawZygierewicz, "Practical Biomedical Signal Analysis Using MATLAB", 1st Edition, CRC Press, 2011.

CORSE:-2.7 **INTERNET OF THINGS AND APPLICATION**

UNIT– I (10 hours)

IoT & Web Technology The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.

UNIT– II (8 hours)

M2M to IoT – A Basic Perspective – Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

UNIT– III (8 hours)

IoT Architecture -State of the Art – Introduction, State of the art, Architecture Reference Model-Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

UNIT– IV (10 hours)

IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.

References:

1. Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.
2. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013.
3. CunoPfister, “Getting Started with the Internet of Things”, OReilly Media, 2011.

CORSE:-2.8 **MACHINE LEARNING SYSTEM**

UNIT– I (10 hours)

Supervised Learning (Regression/Classification) Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes, Linear models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Nonlinearity and Kernel Methods, Beyond Binary Classification: Multi-class/Structured Outputs, Ranking.

UNIT– I (8 hours)

Unsupervised Learning, Clustering: K-means/Kernel K-means, Dimensionality Reduction: PCA and kernel PCA, Matrix Factorization and Matrix Completion, Generative Models (mixture models and latent factor models)

UNIT– III (8 hours)

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)

UNIT–IV (10 hours)

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning, Recent trends in various learning techniques of machine learning and classification

References:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.