Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Electronics Engineering &Electronics & Telecommication Engineering

Name of the Course: Ph. D. Course Work Paper No. 3

(Syllabus to be implemented from w.e.f. June 2021)

Punyshlok Ahilyadevi Holkar Solapur University, Solapur
Electronics Engineering and Electronics & Telecommunication Engineering
Ph.D. Course Work Syllabus December 2020 *V2.0*

Course/Paper-3 (Advanced Knowledge in Core domain of Concerned Subjects)

Note –

1. *Course/Paper -3 shall be common for Electronics Engineering and Electronics and Telecommunication Engineering*
2. *Candidate shall select an elective in consultation with guide from below list*
    a. *Machine Learning*
    b. *Advances in Image and Video Processing*
    c. *Advances in Telecommunication*

Elective a: Machine Learning

Unit-I	**Introduction:** Definition of learning systems, goals and applications of machine learning, aspects of developing a learning system: training data, concept representation, function approximation. **Concept Learning:** The concept learning task, concept learning as search through a hypothesis space, general-to-specific ordering of hypotheses, finding maximally specific hypotheses, version spaces and the candidate elimination algorithm, learning conjunctive concepts, the importance of inductive bias	14 Hrs 1 Credits 20 Marks
Unit-II	**Decision Tree Learning:** Representing concepts as decision trees, recursive induction of decision trees, picking the best splitting attribute: entropy and information gain, searching for simple trees and computational complexity, Occam's razor, overfitting, noisy data and pruning. **Artificial Neural Networks :** Neurons and biological motivation, linear threshold units, Perceptrons: representational limitation and gradient descent training, multilayer networks and backpropagation, convolution neural networks and deep learning	18 Hrs 2 Credit 30 Marks
Unit-III	**Computational Learning Theory :** Models of learnability: learning in the limit; probably approximately correct (PAC) learning, sample complexity: quantifying the number of examples needed to PAC learn, computational complexity of training, sample complexity for finite and infinite hypothesis spaces, mistake bound model of learning	18 Hrs 2 Credit

	Instant Based Learning : k nearest neighbor learning, locally weighted regression, radial basis functions, case based reasoning **Sparse Kernel Machines:** Maximum margin classifiers, support vector machines, relevance vector machines	30 Marks
Unit – IV	**Clustering**: k-means, adaptive hierarchical clustering, Gaussian mixture model **Ensemble Learning:** Using committees of multiple hypotheses, bagging, boosting, active learning with ensembles	10 Hrs 1 Credit 20 Marks

Total Credit = 06 ; Total Marks = 100 UA + 50 CA ; Total Hrs = 60

References :

1. Machine Learning, Tom M. Mitchell, McGraw-Hill
2. Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer

Elective B: Advances in Image and Video Processing

Unit-I	**Image and Video Foundation** Image and video formats, Sampling in 2-dimension (2-D) and 3-dimension (3-D), image processing operations, digital video basics	10 Hrs 1 Credit 20 Marks
Unit-II	**Image and Video Enhancement** Histogram, Point processing, spatial operations, transform operations, multi-spectral image enhancement, fundamentals of 2-D motion estimation and motion compensation, frame rate conversion, deinterlacing	18 Hrs 2 Credit 30 Marks
Unit-III	**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.	18 Hrs 2 Credit 30 Marks
Unit – IV	**Image and Video Restoration** Image observation models, inverse & Wiener filtering, generalized inverse, SVD and iterative methods, maximum entropy restoration, Bayesian methods, blind de-convolution, intraframe shift invariant restoration, multiframe restoration.	14 Hrs 1 Credits 20 Marks

Total Credit = 06 ; Total Marks = 100 UA + 50 CA ; Total Hrs = 60

References :

1. Fundamentals of Digital Image Processing, K. Jain, Pearson education (Asia) Pte. Ltd. / Prentice Hall of India, 2004
2. Handbook of Image & Video Processing, Al Bovik, Elsevier Academic Press, 2nd Edition
3. Multidimensional Signal, Image and Video Processing and Coding, John W. Woods, Academic Press, Elsevier, 2006.
4. Fundamentals of Multimedia, Z. Li, M.S. Drew, Pearson education (Asia) Pte. Ltd., 2004
5. Digital Image Processing, R. C. Gonzalez, R. E. Woods, Pearson education (Asia) Pte. Ltd. /Prentice Hall of India, 2004, 2nd Edition
6. Digital Video Processing, M. Tekalp, Prentice Hall, USA, 1995

Elective c: Advances in Telecommunication

Unit-I	**Cooperative Communication and Networks :** Introduction to the cooperative communication, Basic Techniques, Purpose, Benefits and Drawbacks, Applications of Cooperative Communications, Implementation Scenarios and Issues, Concept of MIMO and Smart Antennas	12 Hrs 1 Credit 20 Marks
Unit-II	**Cognitive Radio Network :** Cognitive radio network architectures- Cognitive Resource Manager Framework, Architectures for Spectrum Sensing, Network Optimization through Utilities, Policy Support as a Part of the Architecture Spectrum Sensing and Identification- Primary Signal Detection, Energy Detection Techniques, Cyclostationary Feature Detector, Matched Filter, Cooperative Sensing Spectrum Access and Sharing- Introduction and Classification, Unlicensed Spectrum Sharing, Licensed Spectrum Sharing	18 Hrs. 2 Credit 30 Marks
Unit-III	**Recent topics in Communication :** E-Business- Introduction and benefits of E-Business, Business revolution, Security issues in E-Business, Common Vulnerabilities in e-Business, Prevention Mechanism Blockchain Technology- Introduction, Need for Blockchain Security, Characteristics and Types of Blockchains, Architecture and Working of Blockchain Technology, Challenges faced and future of blockchain technology Green Communication- Introduction, Broadband Access Evolution, Cell Site Power Consumption Modeling, Power and Energy Metrics, Energy and Throughput Efficiency in LTE Radio Access Networks	18 Hrs 2 Credit 30 Marks
Unit – IV	**5G Communication** : Interference management, mobility management and dynamic reconfiguration, Spectrum, the 5G wireless propagation channel models, Simulation methodology	12 Hrs 1 Credit 20 Marks

Total Credit = 06 ; Total Marks = 100 UA + 50 CA ; Total Hrs = 60

References :

1. K. J. Ray Liu, Ahmed K. Sadek, Weifeng Su and Andres Kwasinski, Cooperative Communications and Networking, Cambridge University Press 2009
2. A. M. Wyglinski, M. Nekovee, Y. T. Hou, Cognitive Radio Communications and Networks-Principles and Practice, Elsevier, 2010
3. D-N Le, R. Kumar, B. K. Mishra and M. Khari, Cyber security in Parallel and Distribute Computing: Concepts, Techniques, applications and case studies, Wiley 2018
4. K. Samdanis, P.Rost, A. Maeder, M. Meo and C. Verikoukis, Green Communications: Principles, Concepts and Practice, Wiley 2015
5. A. Osseiran, J. F. Monserrat and P. Marsch, 5G Mobile and Wireless Communications Technology, Cambridge University Press 2016