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Bachelor of Technology (B.Tech.) VIII Semester (Information Technology)

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S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical						
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	IT81	PEC/DLC	Professional Elective Course-IV	70	20	10	-	-	100	3	1	-	4
2	IT82	OEC/DLC	Open Elective Course-III	70	20	10	-	-	100	3	1	-	4
3	IT83	PI	Major Project / Internship	-	-	-	150	100	250	-	-	16	8
			Total	140	40	20	150	100	450	**6**	**2**	**16**	**16**

Note: 1. Departmental BOS will decide list of three/four optional subjects those are available in MOOC/NPTEL, PEC as well for OEC.

Professional Elective Course-IV		
S.No.	**Subject Code**	**Subject Name**
1	IT81A	Fuzzy Logic & Neural Networks
2	IT81B	Natural Language Processing
3	IT81C	Sensor Networks

Open Elective Course-III		
S.No.	**Subject Code**	**Subject Name**
1	IT82A	Introduction to Robotics
2	IT82B	Image Processing and GIS
3	IT82C	Computer Vision

Note: 2. Students going for internship would have to opt MOOC/NPTEL subjects decided / listed by the HOD / Coordinator.

Professional Elective Course-IV		
S.No.	**Subject Code**	**Subject Name**
1	IT81D	NPTEL-1
2	IT81E	NPTEL-2
3	IT81F	NPTEL-3

Open Elective Course-III		
S.No.	**Subject Code**	**Subject Name**
1	IT82D	NPTEL-4
2	IT82E	NPTEL-5
3	IT82F	NPTEL-6

Note: 3. For Major Project/ Internship, evaluation is based on work done, quality of report, presentation and performance in viva-voce through department project supervisor / Industry Project Coordinator.

1 hour lecture (L) = 1 credit	1 hour Tutorial (T) = 1 credit	2 hour Practical (P) = 1 credit

PEC: Professional Elective Course, OEC: Open Elective Course, PI: Project and Internship, DLC: Distance Learning Course

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Subject Code	Subject Name and Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total	L	T	P	
		End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work					
IT81A	Fuzzy Logic And Neural Networks	70	20	10	-	-	100	3	1	-	4

Module I
FUNDAMENTALS OF FUZZY LOGIC Basic concepts: fuzzy set theory- basic concept of crisp sets and fuzzy sets- complements- union- intersection- combination of operation- general aggregation operations- fuzzy relations-compatibility relations-orderings- morphisms- fuzzy relational equations-fuzzy set and systems

Module II
ARCHITECTURE OF NEURAL NETWORKS Architectures: motivation for the development of natural networks-artificial neural networks-biological neural networks-area of applications-typical Architecture-setting weights-common activations functions- Basic learning rules- Mcculloch-Pitts neuron- Architecture, algorithm, applications-single layer net for pattern classification- Biases and thresholds, linear separability - Hebb'srule-algorithm -perceptron – Convergencetheorem-Deltarule

Module III
BASIC NEURAL NETWORK TECHNIQUES Back propagation neural net:standard back propagation-architecture algorithm- derivation of learning rules- number of hidden layers--associative and other neural networks- hetro associative memory neural net, auto associative net- Bidirectional associative memory-applications-Hopfield nets-Boltzman machine

Module IV
COMPETITIVE NEURAL NETWORKSNeural network based on competition: fixed weight competitive nets-Kohonenself organizing maps and applications-learning vector quantization-counter propagation nets and applications adaptive resonance theory: basic architecture and operation-architecture, algorithm, application and analysis of ART1 & ART2

Module V
SPECIAL NEURAL NETWORKS CognitronandNeocognitron-Architecture,trainingalgorithmandapplication-fuzzyassociatememories, fuzzy system architecture- comparison of fuzzy and neural systems.

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Text books:

1. T1.Kliryvan- FuzzySystem&FuzzylogicPrenticeHall ofIndia,First Edition.
2. LawrenceFussett-fundamentalofNeuralnetworkPrenticeHall,FirstEdition.

Reference Books:

1. BartKosko,—NeuralnetworkandFuzzySystem‖- PrenticeHall-1994.
2. J.KlinandT.A.Folger,—Fuzzysets‖Universityandinformation-PrenticeHall-1996.
3. J.M.Zurada,—Introductiontoartificialneuralsystems‖-JaicoPublicationhouse,Delhi1994.
4. VallusuRaoandHayagvnaRao,—C++Neuralnetworkandfuzzylogic‖-BPBandPublication,New Delhi,1996.
5. IntelligentSystemsand Control-http://nptel.ac.in/courses/108104049/16

Course Outcomes:

CO1: Explain the neural network.

CO2: Explain the general aggregation.

CO3: To understand standard back propagation-architecture algorithm.

CO4: To get exposure to Hopfield nets-Boltzman machine.

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		Theory			Practical		Total	L	T	P	
		End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work					
IT81B	Natural Language Processing	70	20	10	-	-	100	3	1	-	4

Module I
Introduction: Origins and challenges of NLP - Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata - English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

Module II
Word Level Analysis: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff - Word Classes. Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Midden-Markov and Maximum Entropy models.

Module III
Context-Free Grammars: Grammar rules for English, Treebanks, Normal Forms for grammar - Dependency Grammar - Syntactic Parsing, Ambiguity, .Dynamic Programming parsing - Shallow parsing - Probabilistic CFG, Probabilistic CYK, Probabilistic LexicaJired CFGs - Feature structures, Unification of feature structures.

Module IV
Semantics and Pragmatics : Requirements for representation, First-Order Logic, Description Logics - Syntax-Driven Semantic analysis, Semantic attachments - Word Senses, Relations between Senses, Thematic Roles, selectional restrictions.- Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods - Word Similarity using Thesaurus and Distributional methods.

Module V
Application of NLP: intelligent work processors: Machine translation, user interfaces. Man-Machine interfaces, natural language querying, tutoring and authoring systems, speech recognition, commercial use of NLP.

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Reference Books:

1. Breck.Baldwin, -Language Processing with Java and LingPipe Cookbook, Atlamie Publisher, 2015.
2. Richard M Reese, -Natural Language Processing with Java, OReiliy Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, -Handbook of Natural Language Processing, second Edition, chapman and Hall/cRC press, zol0.
4. Tanveer Siddiqui, U.S. Tiwary. -Natural Language Processing and Information Retrieval, Oxford University press, 2 00 g.

Course Outcomes:

CO1: To familiarize with Origins and challenges of NLP, English Morphology and Edit Distance.

CO2: To understand Word Level Analysis Markov models and Part-of-Speech Tagging.

CO3: To understand Context-Free Grammars Syntactic Parsing and CFG.

CO4: To get exposure to Semantics and pragmatics inNl.p.

CO5: To understand application of NLP like intelligent work processors: Machine translation.

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Subject Code	Subject Name and Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total	L	T	P	
		End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work					
IT81C	Sensor Networks	70	20	10	-	-	100	3	1	-	4

Module I
Basics of Wireless Sensors and Applications, The Mica Mote, Sensing and Communication Range, Design Issues, Energy consumption, clustering of Sensors, Applications

Module II
Data Retrieval in Sensor Networks, Classification of WSNs, MAC Layer, Routing Layer, High Level Application Layer Support, Adapting to the Inherent Dynamic Nature of WSNs.

Module III
Sensor Network Platforms and Tools, Sensor Network Hardware, Sensor Network Programming Challenges, Node-Level Software Platforms.

Module IV
Operating System: TinyOS, Imperative Language: nesC, Dataflow Style Language: TinyGALS, Node-Level Simulators, ns-2 and its Sensor Network Extension, TOSSIM.

Module V
Sensor Network Databases: Challenges, Query Interfaces, High level Database Organization, In-Network Aggregation, Data-centric Storage, Temporal Data

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Text Books :

1. Wireless SensorNetworks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science Imprint, Morgan Kauffrnan Publishers, 2005,rp2009.

Reference Books:

1. Adhoc Wireless Networks: Architectures and Protocols, C.Siva Ram Murthy, B.S.Murthy, Pearson Education, 2004
2. Wireless Sensor Networks: Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach Book, CRC Press, Taylor & Francis Group, 2010
3. Wireless Ad hoc Mobile Wireless Networks: Principles, Protocols and Applications, Subir Kumar Sarkar et al., Auerbach Publications, Taylor & Francis Group, 2008.
4. Wireless Sensor Networks: Signal Processing and Communications Perspectives, Ananthram Swami et al., Wiley India, 2007,rp2009.

Course Outcomes:

CO1: To familiarize with Basics of Wireless Sensors, clustering and Applications.

CO2 To understand Data Retrieval in Sensor Networks and classification.

CO3: To Sensor Network Platforms and Tools .

CO4: To get exposure to query Operating systems and Dataflow Style Language.

CO5: To understand Sensor Network Databases

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SubjectCode	Subject Name and Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total	L	T	P	
		End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work					
IT82A	Introduction To Robotics	70	20	10	-	-	100	3	1	-	4

Module I
Introduction to Robotics: Types and components of a robot, Classification of robots,closed-loopand open-loopcontrol systems; Kinematics systems:Definition of mechanisms and manipulators ,Social issues and safety

Module II
Robot Kinematics and Dynamics: Kinematic Modelling:Translation and Rotation Representation,Coordinate transformation,DH parameters, Jacobian, Singularity, and Statics;Dynamic Modelling:Equations of motion:Euler-Lagrange formulation

Module III
Sensors and Vision System:Sensor:Contact and Proximity,Position,Velocity,Force,Tactile etc. Introduction to Cameras,Camera calibration,Geometry of Image formation, Euclidean/Similarity/Affine/Projective transformations, Vision applications in robotics.

Module IV
Robot Control:Basics of control:Transfer functions,Control laws:P,PD,PID,Non-linear and advanced controls Robot Actuation Systems: Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.

Module V
Control Hardware and Interfacing:Embedded systems:Architecture and integration with sensors, actuators, components, Programming for Robot Applications.

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Reference Books:

1.Springer Handbook of Robotics by **Bruno Siciliano**

2.Robotics, Vision, and Control: Fundamental Algorithms in MATLAB by **Peter Corke**

3. Probabilistic Robotics by **Sebastian Thrun**

4. Introduction to Robotics: Mechanics and Control by **John Craig**

Course Outcomes:

CO1:Explain the classification Robots.

CO2: To understand Jacobian, Singularity, and Statics.

CO3: To get Exposure to Hydraulic and Pneumatic.

CO4: To understand P,PD,PID,Non-linear

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SubjectCode	Subject Name and Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total	L	T	P	
		End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work					
IT82B	Image Processing and GIS	70	20	10	-	-	100	3	1	-	4

Module I
Introduction and fundamentals Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.Image Enhancement in Spatial Domain Introduction; Basic Gray Level Functions - Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations - Image Subtraction, image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening - The Laplacian.

Module II
Image Enhancement in Frequency Domain Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters - Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters - Gaussian Low-pass Filters; Sharpening Frequency Domain Filters - Gaussian High-pass Filters; Homomorphic Filtering.
Image Restoration A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering - Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters - Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering - Bandpass Filters; Minimum Mean-square Error Restoration.

Module III
Color Image Processing Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation.
Morphological Image Processing Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms - Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening.

Module IV
Registration Introduction, Geometric Transformation - Plane to Plane transformation, Mapping, Stereo Imaging- Algorithms to Establish Correspondence, Algorithms to Recover Depth
Segmentation, Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Threshotding, Edge Detector Performance, Line Detection, Corner Detection.

Module V
Feature Extraction Representation, Topological Attributes, Geometric Attributes Description, Boundary-based Description, Region-based Description, Relationship.Object recognition Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching

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Reference Books:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. 2-.Digitallmage Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. 3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.
4. 4.Digital Image Processing by A.K. Jain, 1995,-PHI

Course Outcomes:

COl: To Introduce fundamentals of IP, applications and components of Image Processing System along with Image Enhancement in Spatial Domain

CO2: Image Enhancement in Frequency Domain and Image Restoration process and models.

CO3: To understand Color Image Processing and Morphological Image Processing

CO4: To get exposure to Geometric Transformation, Segmentation and

CO5: To understand Feature Extraction and Description, Object Recognition.

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		End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work					
IT82C	Computer Vision	70	20	10	-	-	100	3	1	-	4

Module I
Introduction to computer vision Human vision linage Formation and understanding, pixel- and color transform, classical filtering operations, histogram operations, thresholding techniques, edge detection, techniques, .o-", and interest point, Introduction to computer vision.

Module II
Feature Detection and matching: Introduction to Feature Representation, color histogram analysis, color moments, texture analysis, Harris detector, Feature descriptors, SIFT, image Matching, Feature distance, euclidean distance feature and dimensionality reduction, principal component analysis.

Module III
Shape and Region Analysis: Binary shape analysis, connectedness, object labeling and counting, size filtering, skeletons and thinning, deformable shape analysis, boundary tracking procedures, shape models and shape recognition, boundary length measures, boundary descriptors, chain codes, Fourier descriptors, region descriptors.

Module IV
Image Retrieval: Introduction to Classification and learning techniques, k nearest neighbor, support vector machines, use in Image Retrieval for applications. Accuracy Measurements (Precision, Recall, Sensitivity and Specificity) and Cross Validation Models. Introduction to 3D Vision and Motion.

Module V
Application and Research in Computer Vision: Object Detection, Photo album, Face detection, Face recognition, Eigen faces, Active appearance and 3D shape models of faces Application: Surveillance, foreground-background separation, particle filters, combining views from multiple cameras, human gait, analysis Application : In-vehicle vision system: locating road way road marking - identifying road signs - locating pedestrians.

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Reference Books:

1. Simon J. D. Prince, "Computer Vision: Models, Leaming, ffid Inference", Cambridge University press, 2012.
2.MarkNixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", Third Edition, Academic press, 2012.
3. D. L. Baggio et al "Mastering OpenCV with Practical Computer Vision Projects", Packt publishing, 2012.
4. Jan Erik Solem, "Programming Computer Vision with Python: Tools and algorithms for analyzing images", O'Reilly Media, 2012.

Course Outcomes:

CO1: To introduce Computer vision similarity with Human Vision.

CO2: To understand Feature Detection andMatching.

CO3: To understand Shape and Region Analysis.

CO4: To get exposure to Image Retrieval.

CO5: To understand application and Research in Computer Vision

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