**Bio Medical Image Understanding and Analysis**

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| **Pre-requisites : Basic Programming and Matrix manipulation** |

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| **Unit – I**  **Introduction to Biomedical Image Processing** | **Contact Hours = 8 Hours**  **Flipped Classes Content = 2 Hours** |
| **Digital Image Processing System, Medical Image modalities, Image Algebra, Image transform (FT, DCT, DWT, HOUGH, KL) Image Enhancement in spatial and frequency domain, Image Restoration, Medical applications of Imaging, Frontiers of Image processing in Medicine.**  **Practical Session : Introduction to Mathwork Matlab and Image Processing Toolbox** | |
| **Topics for Flipped Classes: Case study review on Image Morphology, Image Fusion, Image Super Resolution** | |

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| **Unit – II**  **Evolutions of DeepLearning from Neural Network** | **Contact Hours = 8 Hours**  **Flipped Classes Content = 2 Hours** |
| Introduction to Machine Learning (ML), over view of Neural Networks(NN), Limitations of NN, Evolution of Deep Learning (DL), Review of ML and DL, Different types of Neural Networks in Deep Learning, Artificial Neural Networks (ANN), Convolution Neural Networks (CNN), Recurrent Neural Networks (RNN).Practical Session: Introduction to Mathwork Matlab Deep Learning Toolbox | |
| **Topics for Flipped Classes: julia programming language for Deep Learning** | |

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| **Unit – III**  **Convolution Neural Networks and Applications** | **Contact Hours = 8 Hours**  **Flipped Classes Content = 2 Hours** |
| **Introduction to Convolutional Neural Networks (CNN), Building Blocks of CNN, learning algorithms, CNN Flavors, CNNs with RNNs, Hybrid Learning Methods**  **Practical Session : Implementation of CNN using Mathwork Matlab Deep Learning Toolbox** | |
| **Topics for Flipped Classes: julia programming language for Deep Learning application implementation and demonstration** | |

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| **Unit – IV**  **Deep Learning Medical Image Segmentation** | **Contact Hours = 8 Hours**  **Flipped Classes Content = 2 Hours** |
| **Role and significance of Image Segmentation in Medical Image, SegNet, U-Net and V-Net and applications Discussions on available Biomedical Benchmark for users (BraTS,** [**Grand Challenge**](https://grand-challenge.org/) **etc)** | |
| **Topics for Flipped Classes: julia programming language for Deep Learning application Mathwork Matlab Deep Learning Toolbox** | |

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| **Unit –V**  **Deep Learning Medical Image Classification, Analysis and Visualization** | **Contact Hours = 8 Hours**  **Flipped Classes Content = 2 Hours** |
| **Features, dimensionality reduction deep learning classification using Pre-trained model, study of popular pre-trained models medical image application, VGG-16/19, AlexNet, DensNet-201, ResNet-50, Pre-traning model as feature extractor and classifier.**  **Practical Session : Comparative study and implementation of VGG-19, AlexNet, DensNet-201 and ResNet-50 Pre-traning model using Mathwork Matlab Deep Learning Toolbox** | |
| **Topics for Flipped Classes: julia programming language for Deep Learning application implementation and demonstration** | |