# Syllabi for Comprehensive Examination of Eligible Ph. D Scholars

**(Only for the Courses relating to Research Domains for Full Time & Sponsored Part Time)**

**Date of Comprehensive Exam: 16th Aug, 2023**

**Department:** Computer Science and Engineering

**1) Research/Specialization Group: 2**

**(Name of the Group):** Computer Vision and Computational Intelligence

**Syllabus Content** { should be an extract from the course syllabus (not the entire syllabus) which will be helpful for the research work of the scholar }

**(a) Course Code and Course Name:** *CS 511 : Image Processing Syllabus:*

Basics of Image processing:Visual Perception, Image Sampling and Quantization, Basic relationships between Pixels, Image File Format, Histogram Processing, Enhancement using Arithmetic/ Logic Operations, Smoothing and Sharpening Spatial Filters, Restoration in the presence of Noise only - Spatial Filtering, Inverse Filtering, Weiner Filtering.

Feature Selection and Feature Extraction - Probabilistic Separability based criterion functions, Interclass Distance based criterion functions, Branch and Bound algorithm, Sequential Forward/ Backward selection algorithms, (l, r) algorithm, Feature Extraction based on PCA, LDA.

Clustering - Different Distance functions and Similarity Measures, Criterion for Clustering, Minimum Within Cluster Distance criterion, Methods of Clustering - Partitional, Hierarchical, Graph theoretic, Density based, Clustering Validity.

**(b) Course Code and Course Name:** *CS 513 : Artificial Intelligence Syllabus:*

Basics of Artificial Intelligence: State Space Search, Uninformed Search - Breadth First Search, Depth First Search, Stochastic Search - Hill Climbing, Simulated Annealing, A*, AO*, Constraint Satisfaction Problems, First Order Predicate Logic, Planning - Goal Stack Planning, Overview of different forms of Learning: Unsupervised, Supervised, Semi-supervised

Pattern recognition basics: Classification - Bayesian Decision Rule, Minimum Distance Classifier, Mahalanobis distance, Maximum Likelihood Classification, kNN Classifier, Decision Tree, Artificial Neural Networks: Introduction to Expert Systems and Robotics

Expert systems - Architecture, Knowledge Representation, Basic forms of Inference - Abduction, Deduction, Induction, Knowledge Engineering, Robotics - Classification with respect to Geometrical Configuration (Anatomy), Sensors.

**(c) Course Code and Course Name** : *CS 519 : Cloud Computing Syllabus:*

Virtualization: Basic concept– Hypervisor- Types of virtualization- hardware, operating system, server, storage- Features of virtualization- Advantages and disadvantages of different types of virtualization. Cloud Architecture: Types of deployment models-Private, Public , Hybrid, Community, Types of service models-Iaas, PaaS, SaaS.

**(d) Course Code and Course Name:** *CS 701 :Advanced Data Structures and Algorithms Syllabus:*

Array, Linked List, Stack, Queue, Double-Ended Queue, Search Trees, Height-Balanced Trees (or AVL Trees), Weight-Balanced Trees, Red-Black Trees, Splay Trees, Skip List, Balanced Search Trees as Heaps, Hash Tables and Collision Resolution, Hash Functions, Hash Trees, Selection Sort, Bubble Sort, Mergesort, Quicksort, Heapsort, Bucket and Radix Sort, Basic Algorithm Paradigms –

Divide and Conquer, Greedy Algorithms, Dynamic Programming with examples, Minimum Spanning Trees.

**Signatures and Names of DRC Members:**

1. _____ (SOUMEN MOULIK)
2. _____ (Dr. D.S. Roy).
3. _____ (Dr. A.P. Singh)
4. _____ (Dr. D. Kumar)
5. _____ B.K. Balabantaray
6. _____
7. _____
8. _____

**Signature of DRC Chairman**