Week 1

Lecture 1 – 31/12/2008

- Introduction to the course
- What is soft computing
- Evaluation Criteria

Lecture 2 – 01/01/2009

- Crisp Sets – Definition, Characteristic function
- Fuzzy Set - Definition
- Membership function
- Non-ordered and ordered discrete universe
- Continuous universe
- Examples of fuzzy set

Week 2

Lecture 3 – 05/01/2009

- Fuzzy Set Membership functions
- Types of membership functions
- Representation of fuzzy sets
- Linguistic variables and values

Lecture 4 – 06/01/2009

- Support, Core, Normality
- Crossover Points
- Fuzzy Singleton
- $\alpha$-cut and strong $\alpha$-cut
- Convexity

Lecture 5 – 07/01/2009

- Bandwidth, Symmetry, Left-open, Right-open and Closed
- Subset
- Union, Intersection
- Complementation
- Identities
Week 3

Lecture 6 – 12/01/2009
- Identities revisited
- Cartesian Product
- Types of MFs
- Triangular and Trapezoidal

Lecture 7 – 13/01/2009
- Gaussian MF
- Bell MF
- Sigmoidal MF

Lecture 8 – 14/01/2009
- 2D Fuzzy Membership Functions
- Cylindrical Extensions
- Projections
- Composite MFs
- Min and Max Compositions

Lecture 9 – 15/01/2009
- General Complementation Function
- Sugeno’s and Yager’s complements

Week 4

Lecture 10 – 19/01/2009
- Generalized T-norms and conorms
- Generalized DeMorgan’s Law

Lecture 11 – 20/01/2009
- Extension principle
- Fuzzy sets induced by crisp functions

Lecture 12 – 21/01/2009
- Binary Fuzzy Relations
- Composition of fuzzy relations
- Max-min and max-product compositions
Lecture 13 – 22/01/2009

- Linguistic variables, Term Sets, Linguistic hedges
- Concentration and Dilation
- Contrast Intensification
- Orthogonality

Week 5

Lecture 14 – 27/01/2009

- Fuzzy IF THEN Rules
- Interpretation of fuzzy implication
- Implication functions

Lecture 15 – 28/01/2009

- Class Test 1 held

Lecture 16 – 29/01/2009

- Compositional Rule of Inference
- Fuzzy Reasoning
- Single Antecedent Single rule

Week 6

Lecture 17 – 02/02/2009

- Single Antecedent Multiple rules
- Multiple Antecedent Multiple rules
- Class test scripts shown

Lecture 18 – 03/02/2009

- Mamdani fuzzy systems
- Defuzzification procedures

Lecture 19 – 04/02/2009

- Example of Mamdani fuzzy system

Lecture 20 – 05/02/2009
• Sugeno fuzzy system
• Tsukamoto fuzzy system

Week 7

Lecture 21 – 09/02/2009
• Fuzzy Information Retrieval

Lecture 22 – 10/02/2009
• Fuzzy c-means Clustering

Lecture 23 – 11/02/2009
• Fuzzy Image Processing
• Image contrast intensification

Lecture 24 – 12/02/2009
• Introduction to Optimization
• Overview of GA
• Selection, Crossover and Mutation

Week 8

Lecture 25 – 16/02/2009
• GA – contd.
• Use of GA in coding real numbers with finite precision
• Function of two variables
• Mapping minimization problems to GA
• Example function minimization

Lecture 26 – 17/02/2009
• Functions of multiple variables
• Different types of selection operations

Lecture 27 – 18/02/2009
• Other types of selection operation
• Multi-point crossover
• Mutation revisited
Lecture 28 – 19/02/2009

• No class due to mid-sem exam

Week 9

23/02/2009 – 27/02/2009 Mid sem exam

Week 10

02/03/2009

• No Class due to mid-sem exam

Lecture 29 – 03/03/2009

• Constrained GA
• Multi-objective GA
• Pareto-optimality

Lecture 30 – 04/03/2009

• Mid-sem scripts shown
• VEGA
• Dominated solutions

Lecture 31 – 05/03/2009

• MOGA – Goldberg’s approach
• MOGA – Fonseca and Fleming’s approach

Week 11

Lecture 32 – 09/03/2009

• Introduction to SA
• Metropolis algorithm

Lecture 33 – 12/03/2009

• Complete SA algorithm
• Example

Week 12
Lecture 34 – 16/03/2009
- Introduction to PSO

Lecture 35 – 17/03/2009
- PSO details

Lecture 36 – 18/03/2009
- Introduction to neural networks
- Supervised and unsupervised learning
- Multilayer perceptrons

Lecture 37 – 19/03/2009
- Training an MLP
- Backpropagation Algorithm

Week 13

Lecture 38 – 24/03/2009
- Application in Pattern recognition domain
- Hough transform for line and circle detection
- Formation of feature vectors

Lecture 39 – 25/03/2009
- Extraction of fuzzy feature vectors from Hough transform
- Fuzzy MLP output

Lecture 40 – 26/03/2009
- Genetic algorithm for feature selection

Week 14

Lecture 41 – 06/04/2009
- Unsupervised Learning Neural Networks
- Competitive Learning

Lecture 42 – 08/04/2009
• Kohonen Self Organizing Maps

Lecture 43 – 09/04/2009

• LVQ1 and LVQ2

Week 15

Lecture 44 – 13/04/2009

• Clarifications on topics requested by the students
• Feedback

Lecture 45 – 13/04/2009 (afternoon)

• Term Project Seminar

Lecture 46 – 15/04/2009

• Term Project Seminar