— SUBJECT TO CHANGE —

1. Overview of Pattern Recognition: Features (attributes) and feature vectors, classification, supervised vs. unsupervised learning
   [**Chapter 1**]

2. Bayesian classifiers: Bayesian decision theory, discriminant functions, Bayesian classification for Gaussian distributions, estimation of unknown pdfs, k-nearest neighbor techniques
   [**Sections 2.1–2.4, 2.5.1, 2.5.2, 2.5.6, 2.6**]

3. Linear classifiers: Linear discriminant functions, perceptron algorithm, Winnow, exponentiated gradient, least squares methods, support vector machines
   [**Sections 3.1–3.3, 3.4.1, 3.4.2, skim 3.5, selected papers**]

4. Nonlinear classifiers: 2- and 3-layer perceptrons, backpropagation, setting network size (esp. pruning), Cover's theorem, RBF networks, decision trees
   [**Sections 4.1–4.4, 4.6 (skip proof), 4.7, 4.9, 4.10, 4.13–4.15, 4.17**]

5. Context-dependent classification: Markov chain models, Viterbi algorithm, hidden Markov models, Markov random fields
   [**Sections 9.1–9.4, 9.6–9.8**]

6. System evaluation: Estimating classification error (resubstitution, holdout, leave-one-out, confidence intervals), improving performance (bagging, boosting)
   [**Chapter 10, selected papers**]

7. Feature selection (**time permitting**): Preprocessing, hypothesis testing, class separability measures, feature subset selection, Vapnik-Chervonenkis theory/structural risk minimization
   [**Sections 5.1–5.3, 5.5, 5.6, skim 5.9**]

8. Clustering introduction: Applications, examples, cluster types, feature types, proximity measures, categories of algorithms
   [**Chapter 11, Sections 12.1–12.2**]

9. Sequential clustering algorithms: BSAS, MBSAS, TTSAS, cluster refinement
   [**Sections 12.3–12.6**]

10. Hierarchical clustering algorithms: Agglomerative schemes (dendograms, single link algorithm, complete link algorithm), determining the best number of clusters
    [**Sections 13.1, 13.2.1–13.2.4, 13.5**]

11. Algorithms based on function optimization: Isodata (k-means) algorithm (definitely do this), fuzzy clustering and possibilistic methods (time permitting)
[**Sections 14.1, 14.3.1, 14.3.6, 14.5, selected papers**]

12. Cluster validity **(time permitting)**: More on hypothesis testing, internal criteria, external criteria, relative criteria, validity of individual clusters, cluster tendency
[**Chapter 16**]

Important dates: Monday, January 15 (Martin Luther King Holiday, no class)
Monday, March 12–Friday, March 16 (spring break, no class)
Monday, April 23–Friday, April 27 (dead week, project presentations)
Monday, April 30 (project reports due)
Monday, April 30–Tuesday, May 1 (project demonstrations)