Below is a brief outline of the course I would plan to give. It is possible that there is too much material in here. Looking at the past years this course was given it seems like breath is prioritized over depth. That being said, I might have to cut some material if the students find topics interesting and/or difficult.

Class structure

1. 9.00-10.30: Lecture 1
2. 10.30-10.45: Break
3. 10.45-11.30: Lecture 2
4. 11.30-11.40: Break
5. 11.40-noon: Discussion, interactive

Labs

Each day is accompanied by a lab where the students are given a task of either computational or theoretical nature.

Week 1: Algorithms and Data Structures

Day 1: Course Information and AI overview

1.
   - Introductions - Everyone introduce themselves
   - Goals - What is AI? What is the current state of affairs
   - History of AI
   - Where is AI used?
2.
   - Code introduction: OOP paradigm, speed vs. ease tradeoff. Python, C++, Java, R. Coding style, Python PEP, CameCase vs underscore.
   - This weeks goals: Introduce data structures and algorithms.
   - Final Project: Everyone chooses a topic in AI to write about.

Day 2: Knowledge Representation and Data Structures

1.
   - Philosophy of knowledge representation
   - Compute time vs. storage space tradeoff
2.
   - Code introduction: OOP paradigm, speed vs. ease tradeoff. Python, C++, Java, R. Coding style, Python PEP, CamelCase vs underscore.
   - This week's goals: Introduce data structures and algorithms.
3. Arrays, queues, stacks, priority queues

Day 3: Sorting

1. - Bubble sort, merge sort, quick sort
   - Visual sort
2. Recursion
3. Algorithm analysis, Big O notation

Day 4: Trees and recursion

1. - Trees: explain concept
2. - Recursion
   - Traversing trees
   - Tree data structures

Day 5: Graphs

1. - Graphs, uses: facebook, maps, websites, the brain, etc.
   - Algorithms on graphs: search, breath-depth first search.
2. - Dijkstra
   - Kosoraju

Week 2: Applied Statistics

Day 6: Graphs 2

1. - Algorithms:
2. More algorithms: A star
   - Calculus on graphs (new research)

Day 7: Field Trip

Day 8: Probability

1. - Random variable
   - Distributions, expected values, standard deviations
   - Coin tossing
2. Markov chains, random walks, gaussian processes
3. Brownian motion

Day 9: Cool Probability theorems

1. • Eigenvalues, one of the most profound things in math
2. • Eigenvalues in nature, the atom, bus schedules, energy spacings, page rank
   • Semi circle law
   • Universality

Day 10: Prediction (Machine learning)

1. • Introduce concept of models.
   • Linear regression
   • Classification, lack of order relation.
   • Training/Test sample
   • Cross-validation
   • Overfitting

Week 3: Machine learning

Day 11: Feature Extraction

1. PCA, Dimensionality reduction
2. Robust PCA: Emmanuel Candes' paper
3. Chris Young, guest lecture, AI in Electrical engineering.
   • MAF
   • Covariance estimation
   • Regularization
4. scikit-learn

Day 12: Natural Language and Image Processing

1. Natural Language Processing
   • K-means as image classification

Day 13: Neural Networks

1.
   - Concept
   - Theory
2.
   - Back-propagation
   - Example code
   - LSTM's as natural language processors. Extend to any time series.
   - Deep dream
   - Kaggle

Day 14: Final Presentations