Cognitive Science Program Learning Outcomes

1. **Foundational Assumptions** State, explain, and debate, from diverse perspectives, the "computational / representational assumption" that characterizes cognitive science and provides cohesion for the field. Discuss the nature of and motivation for the "interdisciplinary assumption" that characterizes cognitive science and provides great breadth for the field.

2. **Symbol Systems** Define the symbol system concept, perform simple symbolic computation in LISP and Prolog, and describe classic knowledge representations which are grounded in the physical symbol system hypothesis, including semantic nets, state spaces, frames, scripts, and production systems.

3. **Neural Networking** Identify and define basic neuroanatomical components, describe fundamentals concepts associated with neuroscience, and engage in neural network modeling to the extent that conversational fluency with connectionism is achieved for purposes of application and debate.

4. **Darwinian Processes and Phenomena** Articulate evolutionary theory both in classical terms and from an abstract algorithmic perspective, describe the standard computational instantiations of this theory (genetic programming and genetic algorithms), and explain how evolutionary ideas and extensions are providing new insights into the nature of the mind. Discuss fields of knowledge that are grounded in evolutionary theory, like evolutionary psychology and memetics.

5. **Language and Culture** Define and discuss the basic elements of language, including phonology, morphology, syntax, semantics, and pragmatics. Describe the role of image schema and conceptual metaphor in making meaning. Discuss big ideas in language and culture such as Saussure's dichotomies, his work on structuralism and Levi-strauss' application of it to cultural understandings, the work of Propp and Greimas on narratology, Jacobson's functions of communication, Grice's maxims, the Whorf hypothesis, and Merlin Donald's theories on the origin of the modern mind.

6. **Psychological Investigations** Delineate elements of psychological experimentation and discuss issues pertaining to statistical reasoning and research methods. Investigate the merits of various cognitive models of psychological processes pertaining to perception (the Gestalt Guys, Gibson), attention (Broadbent, Kahneman), memory (Miller, Anderson), and learning (Piaget, Vygotsky, Bruner, Papert).

7. **Consciousness and Controversies** Characterize the big issues, such as qualia and intentionality, and discuss/debate controversies associated with the field, such as the Chinese Room and the Imagery Debate.

8. **Embodiment, Emergence, and Distributed Cognition** Provide synopses of emerging fields which are increasingly central to cognitive science, such as situated cognition, complex dynamical systems, and distributed cognition.

9. **Formal Systems and Theories of Computation** Describe and discuss formalisms such as Post production systems, Turning machines, Church's Lambda Calculus, propositional and predicate calculus, generative grammars, typographical number theory, Lindenmayer systems.

10. **Algorithms and Automata** Discuss well-known algorithmic approaches to cognitive processing such as Marr's tri-level model of visual processing and and Doug Hofstadter's parallel terraced scan approach to perception. Describe the essentials of Markov processes for modeling an assortment of cognitive phenomena. Describe automota such as finite state machines and recursive transition networks.