Department: Cognitive Science

Course No.: COGS 201

Credits: 3

Title: Foundations of Cognitive Science

Contact: Whitney Tabor

Content Area: CA3 Science and Technology

Catalog Copy: COGS 201. Foundations of Cognitive Science Either semester . Three credits. Open to sophomores or higher. How do you build a mind? Focuses on testing integrated hypotheses drawn from results in anthropology, computer science, linguistics, neuroscience , philosophy, & psychology.

Course Information:

a. The Cognitive Science Major, and this broad, introductory course, are concerned with an outstanding fact about the study of mind today: many valuable developments are taking place in parallel across the disciplines and yet the most challenging, and possibly the most important goal, is to integrate these perspectives in order to understand systems of the mind, especially the complex interactions among its many facets. There are now many well-credentialed integrative theories that have been proposed in cognitive science; this course is primarily concerned with presenting and evaluating these theories with reference to empirical data from the many contributing sciences of the mind. We expect the students to achieve a good theoretical grounding in cognitive science, to acquire an understanding of experimental design, and to learn how high-level theory makes contact with empirical data.

b. Readings for the course (selected from numerous sources, including textbooks and original articles) aim at a combination of high-level theory and concrete applications. They have been carefully chosen for their accessibility to sophomores. We have also designed entry-level exercises : six of these short study question sets will be assigned over the course of the semester. Some questions are formulated so the students will focus on what is theoretically important; others ask them to design or evaluate particular experiments; the remainder are technical exercises. Three exams are given over the course of the semester. These include a mixture of short answer, technical problems, and essay questions. Emphasis is on hypothesis testing. Class participation is monitored on a daily basis. The final grade is determined primarily by exam performance, with 20% determined by effort on the study questions. Class participation is capable of bumping a grade up or down by one increment (e.g., B to B-, B+ to A).

c . The syllabus is organized into four major sections: 1. Phenomenology of cognitive science 2. The classical computational model 3. Neurally -inspired models 4. Dynamical systems, self-organization and embodiment. A number of conceptual dichotomies are important in the field (e.g ., serial vs. parallel, modular vs. interactive, innate vs. learned). These continually recur in

the discussions and will be highlighted throughout the course. They also allow us to achieve depth without sacrificing too much breadth: the in-depth study of a theoretical approach applied to a focused example allows the students to grasp a number of dichotomies, which we may then use to portray other parts of the field in broad strokes. With carefully chosen targets for in-depth study, students come out of the course with a good grounding for further study in any related area. Formal modeling with various kinds of computers has played a significant role in the development of Cognitive Science. The course introduces students to the idea of building models that behave like people in important regards. It gives them practice in the process of taking a plausible insight and turning it into a hypothesis that is explicit enough to be both tested and implemented.

How Meets Goals of Gen Ed.: COGS 201 will help students

(1) become more articulate. Student discussion participation often takes the form of articulation of theories of why things work they way they do. Socratic questioning by the professors requires students to think on the spot and hone their ideas verbally. Writing assignments require clarity and conciseness.

(2)acquire intellectual breadth and versatility because it incorporates elements from a wide variety of academic disciplines.Creative synthesis is ongoing in the field, and a number of important issues are being raised that are relevant to a wide range of sciences: e.g. , How are people cognitively similar to and different from animals ? Is formalization possible for a theory of mind? What analogies are there between language systems and biological systems? Does neuroscience intersect with philosophy?

(3) acquire critical judgment. In part because it is a young science, it is possible for the students to absorb sufficient background material in a single course that some of the important issues subject to current experimental investigation are within their ken. Thus, students have ample opportunity to exercise their critical judgment . Study and exam questions reinforce this process by asking students to critique existing accounts and generate and defend new ones .

(5)acquire awareness of their era and society. The emergence of cognitive science is closely related to the development of the digital computer , the rapid growth of knowledge of the brain, and the emergence of complex socio-economic feedback systems in the global economy (e.g., the internet). Study in this field is thus particularly helpful in preparing students for work and intellectual involvement in the 21st century.

CA3 Criteria: Currently in Area 3 there are very few non-lab General Education courses from which to choose, including only two at the 200 level. COGS 201 would thus help fill a gap. In addition, it would fully address the goals specific to Area 3. First, regarding Criterion 1, the course introduces students to a body of knowledge spanning at least five disciplines, and traces the structure of its nascent coherence. In our Course Development Proposal for the Chancellor's Competition in Spring, 2006, we laid out plans to improve our representation of contemporary methods by consulting with a number of our colleagues and integrating their knowledge and perspectives into the course materials . We are currently in the middle of this consulting process. Regarding Criterion 2, the current contentiousness of a number of problems in cognitive science

(e.g., Do brain regions correspond to linguistic modules? Does feedback play an important role in the stabilization of mental states?) also helps promote an understanding of the interplay among data, hypotheses, and principles better than when the answers are already widely agreed on (as is typical at the introductory level in more established sciences). COGS 201 will help students acquire a better understanding of modern scientific inquiry in a second important way, by helping them to appreciate the increasingly interdisciplinary nature of many areas of inquiry. Regarding Criterion 3, because people are cognitive creatures, both the empirical phenomena and the theoretical questions of the field are particularly accessible in Cognitive Science. This means that many novices take a natural interest in and have some basis for comprehending unresolved issues (e.g., How much is learned, how much innate? Can a computer be creative?). We build on these tendencies by teaching students how to formalize their intuitive views and stand them alongside established models for systematic comparison. Finally, regarding Criterion 4, our method of letting the students themselves offer ideas about how to answer fundamental questions and of helping them formalize and test those ideas helps promote competence and tends to encourage them to go further on their own. In particular, this course will help sophomores and first-semester juniors germinate ideas that they can subsequently turn into experiments and senior theses.

Role of Grad Students: N/A