This course covers the psychological study of human information processing in terms of structure, process, and application. The representation of knowledge in memory is addressed as is the cognitive processes used for information acquisition, information retrieval, and forgetting. The cognitive processes of attention, pattern recognition, language, comprehension, and thinking will be reviewed in terms of their application to cognitive activities such as decision-making, reasoning, problem solving, and creativity. The application of cognitive theory to artificial intelligence is also discussed.

Prerequisite(s): PSY 101. Credits: 3 (3,0)

PREREQUISITES: PSY 101, PSY 130 or PSY 131, or permission of the Department Chairperson

GENERAL EDUCATION: This course does NOT fulfill any general education requirements.

REQUIRED FOR: Applied Psychology Program

ELECTIVE FOR: All curricula with upper level social science electives.

Cognitive Psychology

Course Description

This course covers the psychological study of human information processing in terms of structure, process, and application. The representation of knowledge in memory is addressed as is the cognitive processes used for information acquisition, information retrieval, and forgetting. The cognitive processes of attention, pattern recognition, language, comprehension, and thinking will be reviewed in terms of their application to cognitive activities such as decision-making, reasoning, problem solving, and creativity. The application of cognitive theory to artificial intelligence is also discussed.

Behavioral Objectives

1. The student will acquire knowledge of current theories of cognitive processes addressing memory, knowledge representation, decision-making, reasoning, problem solving, and creativity.

2. The student will be familiar with the empirical basis for cognitive theories in terms of the major research studies on which the theories are based and their strengths and weaknesses.

3. The student will understand the historical context in which our current knowledge and theories of cognitive processes are based.

4. The student will obtain a sufficient understanding of the theoretical approaches to cognition to apply them within their field of interest.

5. The student will understand the limitations of our knowledge of cognitive processes and will be familiar with the major issues being debated by researchers in the field.

COURSE OUTLINE

The following is an overview of the topics to be covered in this course. Each unit will include relevant theory, current research, and its application.

Unit 1: Introduction to Cognitive Psychology
The nature of thought, cognitive processes, and mental representation was debated by early philosophers such as Plato and Aristotle and there has been a long history of theoretical approaches to these aspects of human functioning. In this unit, the historical evolution of our concept of cognition and information processing will be discussed. This history provides an excellent foundation for understanding current theoretical approaches to cognition.
Unit 2: Perceptual Processes
Perceptual processes are the means by which stimuli first come into contact with human cognition. In this unit the basics of sensation and perception will be presented. While the emphasis will be on visual and auditory processes, other sensory capabilities will be discussed as well. Current theory and research in iconic, echoic and sensory storage will be reviewed. When stimuli are detected by human sensory organs and perceived, the process of pattern recognition occurs. Human cognition has a tremendous capability to analyze stimuli in order to detect and construct meaningful patterns. In this unit, models of pattern recognition, ranging from feature detection to analysis-by-synthesis, will be discussed.

Unit 3: Attention
Early models of attention emphasized the distinction between conscious and unconscious information processing. More recent models reflect an integrated approach where attention is considered a limited resource and attentional processes help coordinate information processing and allocate attention along a continuum from relatively unconscious to conscious processes. In this unit, models of attention and the control of attentional processes between and across different aspects of information processing will be discussed. The research discussed will include unconscious monitoring of the environment, strategies for shifting attention between activities, and strategies for dividing attention between activities.

Unit 4: Memory
Understanding the structural and functional aspects of human memory has been a central theme in the history of psychology. One reason for this is the central role that memory plays in information processing. In this unit current theoretical approaches to the structure and operation of human memory will be presented and the empirical support for each will be reviewed. The unit will address the processes by which information is encoded (stored in memory) and decoded (retrieved from memory). The theories discussed include the concept of memory as reflecting (1) distinct types, such as short-term and long-term memory, each with different functional properties, (2) levels of processing from surface characteristics to deep meaning, and (3) memory as being reconstructive, i.e., recall is predominantly a reconstruction of events from a few bits of high-level information and the person's general understanding of the context of the events being remembered.

Unit 5: Knowledge Representation
A distinction is frequently made between memory and knowledge. Where memory is the recall of information or events, knowledge is the abstract representation of our understanding information and relationships between the objects and events in the world. Thus, while we would typically say that we remember our phone number, we don't remember that 2+2+4 - we know it. Theoretically, however, the distinction is not as clear. In this unit, theories and research addressing knowledge representation will be discussed. The ways in which knowledge is cognitively stored, maintained, developed, and retrieved will be presented.
Unit 6: Language
Language is one of the most remarkable aspects of human cognition. Language is a complex process involving sounds, words, structures, functions. Yet, young children can learn to speak multiple languages at an early age, typically long before they can engage in much simpler cognitive processes such as mental arithmetic. In this unit, theories and research addressing human language will be presented. The structure of language will be discussed and research addressing the transformation of speaker sounds to information that is meaningful to the listener will be reviewed as will the processes by which speakers translate ideas into linguistic utterances. The distinction between animal communication and human language will be also be discussed including the research and implications of efforts to teach human linguistic processes to animals.

Unit 7: Intelligence, Reasoning, Problem Solving, and Creativity
In this unit, theories and research on human intelligence will be presented. Like language, the application of knowledge to adaptation to the changing world around us is one of the most interesting aspects of human cognition. Applications of knowledge include those typically associated with "higher-order" cognition such as reasoning, problem solving, and creative processes. Research in these areas will be reviewed to reveal the process used and to identify the condition that support and impede these capabilities.

Unit 8: Metacognition and Cognitive Development
This unit will address the changes in cognition and information processing from infancy to adulthood. Cognitive structures and processes change over the course of development. These changes include such fundamental cognitive capabilities as attention, memory, reasoning, and problem solving. These changes have important implications for presenting information to children both in teaching and general contexts. One of the changes that will be discussed is in the area of metacognition, i.e., one's understanding of his/her own cognitive processes.

Unit 9: Artificial Intelligence
In this unit, efforts to emulate human intelligence in computer systems will be presented. Such systems range in application from understanding basic human capabilities such as language to more complex applications such as modeling the knowledge of specialized expertise, e.g., medical diagnosis. Approaches to developing computer models of human intelligence will be discussed as will strategies for knowledge extraction from experts.