

# Attention!

This is a *representative* syllabus.

The syllabus for the course when you enroll may be **different**.

Use the syllabus provided **by your instructor** for the most up-to-date information. Please refer to your instructor for more information for the specific requirements for a given quarter.

# Introduction to Mathematical Models in Experimental Psychology,

## Prior Class Number 609

Roger Ratcliff, Rm. 291B Psychology Building, Class meetings: M 10-12:18

### Course Objectives

This course provides an introduction to basic cognition with a focus on memory research while viewing the material from a theoretical perspective. There will be evaluation of models of processing and representation, where reasonable models exist.

**Lab. component of the course.** This involves taking part in about six 20 minute experiments with data analyzed in class and discussion of intuitions about processing. One experiment encourages students to cheat to see if the analysis techniques of the instructor can uncover strategies that uncooperative students might adopt. There are also two computer simulation exercises that use computer programs already developed: students alter parameters of the models to represent changes in processes that the models are designed to mimic.

The course will require preparation prior to each class: reading chapters from the textbook and 2-4 original papers from the literature. These will require significant effort and short summaries of the readings will be collected each week IF there is evidence that the readings have not been done. All the work is presented with the aim of showing both the good and bad points of the models and approaches, and the last class presents an evaluation of the state of this research area of cognitive psychology. We will ask 1. How good is the model? 2. Is it fundamentally rejected in core assumptions? 3. Is it worth using in more applied/practical domains?

### Student Evaluation

Students will be expected to present 1-2 articles (or parts of article) (10%), write up results from two computer simulation experiments (1-2 pages plus graphs) (two at 20% each), and two research papers (25%, 25% each). Students will be evaluated on an absolute scale.

### Topics

Week 1: Introduction, Modal memory model, STM, LTM. (Read Chs. 1,2 (iconic memory section only),3,4, N&S). Separating STM and LTM (Ch 3,4, N&S), Levels of processing (Ch. 5, N&S).

Week 2: Critiques of levels of processing, Forgetting (Ch. 6, N&S). Cue dependent forgetting, Implicit memory. (Baddeley, 1978; Tulving, 1974; Ch. 7, 8, N&S). **Implicit memory experiment.**

Week 3: Brain, amnesia, counter model for implicit memory. Recognition memory, Introduction to global memory models (Ch. 8, 9, Optional Ch., N&S; Ratcliff & McKoon, 1996; Gillund & Shiffrin, 1984). **SAM model exercise.**

Week 4: Global memory models, rejection, new models (Ratcliff & McKoon, 2000; Ratcliff, Shiffrin & Clark, 1990, Shiffrin & Steyvers, 1997). **Memory experiment. Gillund & Shiffrin (SAM) model exercise due.**

Week 5: Models for associative priming (Optional Ch. p. 372, N&S; Readings). Knowledge, memory for text, (Ch. 10, N&S; Ratcliff & McKoon, 1981, 1992, McKoon & Ratcliff, 1986). **Priming experiment.**

Week 6: Reaction time models, diffusion model, RT and memory (Optional Ch., N&S; Ratcliff & McKoon, 2008; Wagenmakers, 2008). **Simple random walk and counter model exercise.**

Week 7: Review of RT models, Neuroscience and perceptual decision making. (Ch. 14, N&S; Ratcliff & Smith, 2004, Smith & Ratcliff, 2004; Gold & Shadlen, 2008). **RT expt. (dots). Paper 1 due.**

Week 8: Aging, Memory, Death and Reaction Time. (Deary & Der, 2005; Ratcliff, Thapar, Gomez, & McKoon, 2004). **Simple random walk and counter model ex. due.**

Week 9: Categorization, instance based models, decision bound models, connectionist models, hybrid models (Nosofsky, 1986; Ashby & Townsend, 1986; Erickson & Kruschke, 1998; Rouder & Ratcliff, 2004).

Week 10: Word recognition models. (McClelland & Rumelhart, 1981; Seidenberg and McClelland, 1989; Grainger & Jacobs, 1996; Ratcliff, Gomez, & McKoon, 2004). **RT screw the experimenter experiment (dots).**

\*Week 11: Dual and Single process memory models. Yonelinas, 1994; Jacoby, 1991; Van Zandt & Ratcliff, 1995; Dunn, 2004; Squire, Wixted, & Clark, 2007.

\*Week 12: Neuropsychology of memory. Wagner, Shannon, Kahn, & Buckner 2005; Rugg & Curran, 2007; Eichenbaum, Yonelinas, & Ranganath 2007; Cabeza, Ciaramelli, Olson, & Moscovitch 2008.

\*Week 13: EEG, fMRI, and human perceptual decision making. Ratcliff, Philastudies, & Sajda, 2009; Foresmann et al., 2009.

Week 14: What progress in psychology: 20 questions paper, Newell (1973), Tulving & Madigan (1970), Roberts & Pashler (2000), Ratcliff (2002). **Paper 2 due.**

\* These topics are changing rapidly and these are the readings I would use today, but in a couple of years they would be different possibly.

## **Students with Special Needs**

Any student who feels that he/she may need an accommodation based on impact of a disability should contact Professor Ratcliff (2-7916) privately to discuss his/her special needs. Also contact the Office of Disability Services (1-3307) to coordinate such accommodations.

### **Academic Misconduct**

All students at the Ohio State University are bound by the Code of Student Conduct (see <http://oaa.ohio-state.edu/coam/code.html>). Violations of the code in this class will be dealt with according to the procedures detailed in that code. Specifically, any alleged cases of misconduct will be referred to the Committee on Academic Misconduct. It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct.

### **Teaching Method.**

Classes will be part lecture and part discussion/tutorial. There will be a number of in-class demonstrations. Students will participate in experiments in the lab. to provide data for examination in class. The course will be flexible so as to reduce emphasis on some topics and spend more time on others depending on demand, background, interest, etc.

**Paper 1.** Evaluate a model of implicit memory, Contrast the implicit memory views, OR Evaluate a global memory model

**Paper 2.** Topics. Any topic from what was studied but with a theory or model based interpretation

**Text:** Neath & Suprenant, Human Memory, Second Ed., Thomson Wadsworth, 2003. (In readings above - N&S)  
Reading packet of about 3-4 new papers per class.

**Office Hours:** I am in most of the time, say 9:30 to 4:00. Office hours by appointment (call, 2-7916) or email [ratcliff.22@osu.edu](mailto:ratcliff.22@osu.edu). If I am in (i.e., I have not wandered off) I am available. Call or email to be sure I am in (you can chance it of course and drop by).