CUPS Approved Courses (Last updated July 2012)

The following courses are approved for satisfying the requirements of the CMU Usable Privacy and Security Doctoral Training Program and CyLab Usable Privacy and Security Meritorious Achievement Certificate Program. Two approved minis can be substituted for a full-semester course. Students may petition the CUPS Director to add courses to this list.

Common core:

5-899/8-734 Usable Privacy and Security - Our "Usable Privacy and Security" course, developed at CMU in 2006 by faculty in three departments, is designed to introduce students to usability and user interface problems related to privacy and security and to give them experience in designing studies aimed at helping to evaluate usability issues in security and privacy systems. The course was designed for students interested in privacy and security who would like to learn more about usability, as well as for students interested in usability who would like to learn more about security and privacy. In addition to faculty and guest lectures, students present and discuss usable privacy and security research papers. Students work in interdisciplinary teams on a project throughout the semester under the guidance of faculty mentors. [usually taught by Cranor and/or Hong]

Security courses:

8-731 Web Commerce, Security and Privacy - The objective of this course is to introduce students to the technologies of web commerce, security and privacy as well as to related business, policy and usability issues. The course is organized around three parts: web security & privacy technologies; ethical, social and political issues (e.g., privacy, intellectual property, Internet Governance and Domain Names, legal framework for web commerce); web commerce. [usually taught by Saheh]

18-630/19-631/95-830 Introduction to Security and Policy – This course introduces junior graduate students to the technical foundations of computer and communications security using deployed systems as case studies. The course assumes a basic working knowledge of computers and networks, but no prior exposure to topics in computer or communications security. [usually taught by Perrig]

14-741/18-631 Introduction to Information Security - This course introduces the technical and policy foundations of information security. The main objective of the course is to enable students to reason about information systems from a security engineering perspective, taking into account technical, economic and policy factors. [usually taught by Christin]

18-730 Introduction to Computer Security - This course provides a principled introduction to techniques for defending against hostile adversaries in modern computer systems and computer networks. Topics covered in the course include operating system security, network security, user authentication technologies, security for network servers, web security, and security for mobile code technologies. [usually taught by Gligor]

18-731 Network Security - This course provides an in-depth study of network attack techniques and methods to defend against them. Topics include firewalls and virtual private networks; network intrusion detection; denial of service (DoS) and distributed denial-of-service (DDoS) attacks; worm and virus propagation; tracing the source of attacks; traffic analysis; techniques for hiding the source or destination of network traffic; secure routing protocols; protocol scrubbing; and advanced techniques for reacting to network attacks. [usually taught by Perrig]

18-732 Secure Software Systems - This course studies approaches, mechanisms, and tools used to make software systems more secure. The course includes four main modules:

architectural approaches to building secure software (e.g., confinement, virtual machines, trusted computing); software analysis (e.g., static analysis and testing, model checking); language-based approaches to building secure software (e.g., type systems, proof-carrying code); and run-time enforcement of security policies (e.g., dynamic taint analysis). The course also covers topics such as the importance of usability to building secure software systems. [usually taught by Datta or Bauer]

18-739 Special Topics in Security

Privacy courses:

8-733/19-608/95-818 Privacy Policy, Law and Technology - This course provides an in-depth look into privacy, privacy laws, and privacy-related technologies and self-regulatory efforts. Students will study privacy from philosophical, historical, legal, policy, and technical perspectives and learn how to engineer systems for privacy. [usually taught by Cranor]

95-762 Privacy in the Digital Age - This "mini" course, taught over half a semester, combines technical, economic, legal, and policy perspectives to present a holistic view of privacy and its role and value in the digital age. It begins by comparing early definitions of privacy to the current information-focused debate. It then focuses on technological aspects, economic aspects, legal aspects, managerial implications, and policy aspects of privacy. [usually taught by Acquisti]

95-763 Privacy and Confidentiality: Models and Implementations – This "mini" course looks at practical methods for disclosure limitation for microdata (raw data about individuals or firms) and tables (aggregations of microdata). Methods such as data swapping, data shuffling, noise addition and synthetic data, among others, are considered. We also look at some analogues of these methods for geographical data. Finally, privacy preserving data mining is briefly surveyed.

Human computer interaction courses:

05-391 Designing Human Centered Systems - This course offers a single introduction to designing, prototyping, and evaluating user interfaces. It is intended for all majors, and requires a basic level of programming.

05-410 Human-Computer Interaction Methods - This course provides an introduction to the field of human-computer interaction (HCI). It introduces students to tools, techniques, and sources of information about HCI and provides a systematic approach to design. The course increases awareness of good and bad design through observation of existing technology, and teaches the basic skills of task analysis, and analytic and empirical evaluation methods. [usually taught by John]

05-810 Computer Supported Cooperative Work: Distributed Groups and Online Communities - The internet has made it possible to collaborate in ways that were not imagined in the days before the world was wired. Such collaborators have adopted a range of technologies, from conventional software development tools such as version control and change management systems, to more general collaboration technologies such as e-mail, chat, and wikis. We consider such phenomena as social loafing, communication and memory within organizations, and group decision making, as well as more applied topics, including the effect of video, participation in online communities, and the nature of large electronic groups. [Usually taught by Kraut]

05-816 Applied research methods - This course is for Ph.D level graduate students who will carry out research in areas related to human-computer interaction. The course includes hands-on practice of skills such as experimentation, web survey design, ethnographic observation, and content analysis.

05-417 Computer-mediated communication - This course examines fundamental aspects of interpersonal communication and considers how different types of computer-mediated

communications (CMC) technologies affect communication processes. Topics include: conversational structure and CMC, tools to support nonverbal and paralinguistic aspects of communication such as gesture and eye gaze, and social and cultural dimensions of CMC. [usually taught by Dabbish]

05-820 Social Web - This course, jointly taught by a computer scientist and a behavioral scientist, will examine how the social web operates, teach students how to build online communities, and help them understand the social impact of spending at least part of their lives online. We will examine what works and what fails to work in these online environments. [usually taught by Hong and Kraut]

16-899 QoLT Ethnography - This immersive course teaches and demonstrates ethnographic methodology as applied to understanding context in the lives of individuals with disabilities and older adults. Students will be assigned readings on ethnographic analysis, demographics, health care trends, assisted living analyses, etc. The class will also examine related technology insertion cases studies. Students will work in teams to evaluate actual conditions at local facilities, and will complete a term project in which they characterize specific opportunities for technological intervention.

Social and decision sciences courses:

88-702: Behavioral Economics - This course examines the role of social, cognitive and emotional factors on economic decisions, and the processes by which economic principles can be applied to behavior in non-financial domains. Behavioral economics is grounded in comparison to the rationality, or lack thereof, of economic agents, integrating insights from psychology with classical economic theory. [usually taught by Lowenstein]

88-703: Human Judgment and Decision Making - This course reviews the processes underlying decision making, including judgment and choice, including the study of normative, descriptive, and prescriptive theories of decision making, heuristics and biases, cognitive and affective processes.

85-709: Cognition and Instructional Design - This course examines the use of cognitive analyses to design and assess practical instruction which can, in turn, serve as an experimental arena for refining the analyses and improving basic understanding of human cognition. A central focus will be instruction facilitating the learning of conceptual and problem-solving skills needed to deal with scientific or technical subjects.

5-813 Human Factors - This course uses theory and research from human factors, cognitive science, and social science to understand and design the interactions of humans with the built world, tools, and technology. The course will emphasize both individual human factors and organizational arrangements that can amplify or correct human factors problems.

36-743: Statistical Methods for the Behavioral and Social Sciences - This course covers statistical techniques common to behavioral and social sciences, including multiple regression, logistic regression, analysis of variance, and non-parametric analyses.

36-749: Experimental Design for Behavioral and Social Sciences - Statistical aspects of the design and analysis of planned experiments are studied in this course. The design aspect will concentrate on choice of models, sample size and order of experimentation. The analysis phase will cover data collection and computation, especially analysis of variance and will stress the interpretation of results.

Other CUPS courses: (this category includes courses selected because they provide a foundation in areas relevant to current usable privacy and security research efforts)

5-834 Applied Machine Learning - This class is meant to teach the practical side of machine learning for applications, such as mining newsgroup data or building adaptive user interfaces. The emphasis is on learning the process of applying machine learning effectively to a variety of problems rather than emphasizing an understanding of the theory behind what

makes machine learning work. This course does not assume any prior exposure to machine learning theory or practice.

8-732 Law of computer technology - A survey of how legislatures and courts cope with rapidly advancing computer technologies and how scientific information is presented to, and evaluated by, civil authorities. The course is also an introduction to the legal process generally and the interaction between the legal system and technology organizations. Topics include: patents, copyrights in a networked world, law of the Internet, free speech, data security, technology regulation, international law, and transborder crime. [usually taught by Shamos]

8-801 Dynamic Network Analysis - This course provides an overview of the dominant perspectives on organizations and networks from a macro perspective. Topics covered include knowledge management, organizational design, organizational learning, organizational evolution and population ecology, organizational culture, organizations as complex systems, social and organizational networks, and dynamic network analysis. [usually taught by Carley]

8-803 Empirical Methods for Socio-technical research - Empirical methods play a key role in the evaluation of tools and technologies, and in testing the social and technical theories they embody. This course is a survey of empirical methods, appropriate for PhD students in disciplines that involve the relationship between technology and humans, such as Software Engineering and Computation, Organizations, and Society. This course is designed to acquaint you with several basic types of empirical methods including exploratory data analysis, ethnography, interviews, surveys, content analysis, archival analysis, and experimental and quasi-experimental design. [usually taught by Herbsleb]

15-446 Distributed Systems - This course focuses on the design, implementation, and management of distributed systems. It covers fundamental topics such as concurrent programming, coordination, synchronization and election, distributed agreement, replicated data management, checkpointing and recovery, and directory and discovery services. Beyond techniques and algorithms it examines the design and implementation of real-world and research distributed systems, including file systems, shared memory, databases, and mobile applications.

15-780 Advanced AI Concepts - This course is targeted at graduate students who want to learn about and perform current-day research in artificial intelligence---the discipline of designing intelligent decision-making machines. Techniques from probability, statistics, game theory, algorithms, operations research and optimal control are increasingly important tools for improving the intelligence and autonomy of machines. This AI course is a review of a selected set of these tools. The course will cover the ideas underlying these tools, their implementation, and how to use them or extend them in your research.

15-781 Machine Learning - Machine learning studies the question "how can we build computer programs that automatically improve their performance through experience?" This includes learning to perform many types of tasks based on many types of experience. This course is designed to give PhD students a thorough grounding in the methods, theory, mathematics and algorithms needed to do research and applications in machine learning.

18-842 Distributed Systems - The primary objective is to learn the fundamental principles underlying distributed systems, and apply some of this knowledge in developing a real system in a course project (such as a networked multimedia system or a groupware system with built-in mechanisms for supporting high availability). Topics include: models of distributed systems, distributed transactions, distributed file systems, infrastructures for building distributed systems, distributed algorithms, cryptography and distributed security, an overview of distributed multimedia applications, systems and networking support for distributed multimedia systems, and distributed real-time systems.

18-849 Dependable Embedded Systems

88-706: Game Theory - The course will deal exclusively with non-cooperative games. The first half will develop the basic theory; in the second half special topics will be discussed. Throughout the emphasis will be on concepts and results rather than detailed technical proofs. This is an introductory course and no significant previous exposure to game theory will be assumed.

85-717: Cognitive Modeling and Intelligent Tutoring Systems - This course will focus on the combination of cognitive psychology and artificial intelligence required to develop intelligent computer-assisted instruction. A background in artificial intelligence (minimally LISP) and cognitive psychology is required. Half of the course will be project-oriented. We will learn the production system GRAPES and work up to producing an expert system and a tutor for a fragment of calculus.