Human Factors and Ergonomics Approved Course Descriptions

Note: Per University of Minnesota policy, no more than 9 credits of 4xxx level courses are permitted on a graduate degree plan.

Course	Title	Credits	Description
Anth 4035	Ethnographic Research Methods	3	History of and current issues in ethnographic research. Research projects, including participant observation, interviewing, research design, note taking, life history, and other ethnographic methods.
CgSc 8000	Philosophy of Cognitive Science	2	Philosophical framework for analyzing cognitive sciences. Recent developments in metaphysics and epistemology. Nature of scientific theories, methodologies of cognitive sciences, relations among cognitive sciences, relation of cognitive science to epistemology and various philosophical problems.
CgSc 8410	Perspectives in Learning, Perception, and Cognition	2	Lectures/discussions in cognitive sciences by local/visiting faculty.
CSci 5109	Visualization	3	Fundamental theory/practice in data visualization. Emphasizes programming applications. Volume visualization, vector field visualization, information visualization, multivariate visualization, visualization of large datasets, visualization in immersive virtual environments, and perceptual issues in effective data representation. Projects are implemented in C++ using VTK or similar visualization API.
CSci 5115	User Interface Design, Implementation, & Evaluation	3	Theory, design, programming, and evaluation of interactive application interfaces. Human capabilities and limitations, interface design and engineering, prototyping and interface construction, interface evaluation, and topics such as data visualization and World Wide Web. Course is built around a group project.
CSci 5125	Social & Collaborative Computing	3	Introduction to computer-supported cooperative work, social computing. Technology, research methods, theory, case studies of group computing systems. Readings, hands-on experience.
CSci 5619	Virtual Reality & 3D Interaction	3	Introduction to software, technology/applications in virtual/augmented reality, 3D user interaction. Overview of current research. Hands-on projects.
CSci 8115	Human Computer Interaction & User Interface Technology	3	Current research issues in human-computer interaction, user interface toolkits and frameworks, and related areas. Research techniques, model-based development, gesture-based interfaces, constraint-based programming, event processing models, innovative systems, HCI in multimedia systems.

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CSci 8117	Understanding the Social Web	3	Research on the social web. Read, present, and discuss papers, do homework using social web research techniques such as data analysis and simulation. Semester research project.
DES 5165	Design and Globalization	3	Movement of people, products, and ideas. Challenges brought by differences among us.
Des 5185	Human Factors in Design	3	Theories/methods that influence the assessment of physical, social, and psychological human factors. Development of user needs with application to designed products that interact with human body.
Des 8151	Product Development	3	Product development theories/methods as applied in many design fields. Emphasizes retail setting. Seminar format discussion, case studies, observation/critique of hands-on industry product development project.
EPsy 8114	Seminar: Cognition and Learning	3	Advanced study in critical analysis and application of contemporary psychological theory and research in cognition and learning for education.
GDes 8361	Color, Design, and Human Perception	3	Perceptual and psychological aspects of color and design. Human factors of color variables and design strategies that can enhance human experience of, and interaction with, color.
HumF/Kin 5001	Foundations of Human Factors	3	Variability in human performance as influenced by interaction with designs of machines and tools, computers and software, complex technological systems, jobs and working conditions, organizations, and sociotechnical institutions. Emphasizes conceptual, empirical, practical aspects of human factors/ergonomic science.
HumF/ME 5211	Human Factors & Work Analysis	4	Human factors engineering (ergonomics), methods engineering, work measurement. Displays, controls, instrument layout, supervisory control. Anthropometry, work physiology, biomechanics. Noise, illumination, toxicology. Operations analysis, motion study, time standards.
HumF/Kin 5722	Human Factors Psychology	3	Psychological principles that underlie human interactions with technological systems. Techniques/methodologies to assess faulty/incorrect system design. Emphasizes human-centered approaches. Rigorous evaluation of human-machine interaction.
HumF 5874	Service Design: Designing Complex Systems to Improve Service Delivery	4	Real world service delivery problems. Perceptual/cognitive strengths/weaknesses addressed when designing systems.

Course	Title	Credits	Description
HumF 8001	Topics: Human Factors & Ergonomics	2-3	Survey course in human factors/ergonomics, an interdisciplinary science concerned with interaction of performance and behavior with design factors in performance environment. Concepts, methods, empirical findings, different systems applications, and current research. Topics vary.
HumF 8002	Proseminar in Human Factors & Ergonomics	1	Issues and concerns tailored to interests of faculty and students regarding human factors/ergonomics, an interdisciplinary science concerned with interaction of performance and behavior with design factors in performance environment.
IDSc 8711	Cognitive Science	4	Empirically based concepts of knowledge and reason, mental representation and conceptual systems that guide problem solving and decision making. Computational metaphor of mind drawn from psychology, computer science, linguistics, anthropology, and philosophy. Implications for understanding of knowledge work.
IDSc 8721	Behavioral Decision Theory	2	Traditional/current research. Major models/methodologies. Issues of preference, judgment, and choice under conditions of certainty/uncertainty. Seminar format.
IDSc 8722	Heuristic Decision Making	2	How decisions are made, how knowledge is stored/used, how knowledge of variability/feedback influence decisions. Decisions at strategic, operational, individual level. Exceptional performance, pathologies of decision making. Basis for "best practice." How knowledge is managed in decisions, decision failure. Folly, normal accidents, decision problems in which individuals manipulate information to influence/deceive others.
Kin 4133	Perceptual Motor Control and Learning	3	Concepts/principles of coordination/control of perceptually guided movement. Constraints imposed by properties of environment, body (including the nervous system), and goals of behavior. Why we move the way that we do.
Kin 4136	Embodied Cognition	3	Introduction to relations between physical behavior/mental activity. Cognitive, emotional, social aspects. Concepts of embodied cognition, their relation to traditional concepts of mind/body. Lifespan development, empirical research.
Kin 5235	Advanced Biomechanics II: Kinetics	3	Kinetic aspects of human movement (single/multi-joint torques, simple inverted pendulum models, mass-spring systems). Analysis of experimental data and of computer simulations. Lectures, seminars, lab.
Kin 5505	Human Centered Design, Principles & Applications	3	Application of design to meet human needs. Design of fabricated products, tools/machines, software/hardware interfaces, art/culture, living environments, and complex sociotechnical systems.

Course	Title	Credits	Description
Kin 5643	Applied Motion Capture and Movement Analysis Technology	3	Course provides students with the knowledge and tools to effectively analyze human movement patterns in a wide variety of field-based settings, such as assessing sport skill performance or measuring movement deficits after injury. Students will comprehend the basic, underlying components of movement and movement deficits. It is strongly suggested students have taken Physics, Biomechanics, and Human Anatomy.
Kin 5981	Research Methodology in Kinesiology, Recreation, and Sport	3	Defines/reviews various types of research in exercise/sport science, physical education, and recreation studies. Qualitative research, field studies, and methods of introspection as alternative research strategies to traditional scientific paradigm.
Kin 8211	Seminar: Perception & Action	3	Survey of theory/research on use of perceptual information for control of action. Behavioral research on perceptual guidance of daily activities (e.g., standing, walking, driving). Perceptual control in context of expertise (e.g., sports). Perceptual-motor development.
Mktg 8813	Consumer Judgment and Decision Making I	2	Different theoretical approaches taken in judgment and decision-making research. Heuristics/biases, affect in decision making, judgments/decisions over time.
Nurs 7118	Human Factors & Human-Computer Interaction in Health Informatics	3	Principles of human factors and human-computer interaction to optimize research/practice in nursing and health informatics. Interactive system design that accommodates/enhances capabilities of user.
Psy 5014	Psychology of Human Learning and Memory	3	Human memory encoding/retrieval. How we adaptively use memory. Brain systems that support memory. Episodic/semantic memory. Working/short-term memory. Procedural memory. Repetition priming. Prospective remembering. Autobiographical memory.
Psy 5015	Cognition, Computation, & Brain	3	Human cognitive abilities (perception, memory, attention) from different perspectives (e.g., cognitive psychological approach, cognitive neuroscience approach).
Psy 5031W	Perception	3	Cognitive, computational, and neuroscience perspectives on visual perception. Topics include color vision, pattern vision, image formation in the eye, object recognition, reading, and impaired vision.
Psy 5037	Psychology of Hearing	3	Biological and physical aspects of hearing, auditory psychophysics, theories and models of hearing, perception of complex sounds including music and speech. Clinical/other applications.

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Psy 5062	Cognitive Neuropsychology	3	Consequences of different types of brain damage on human perception/cognition. Neural mechanisms of normal perceptual/cognitive functions. Vision/attention disorders, split brain, language deficits, memory disorders, central planning deficits. Emphasizes function/phenomenology. Minimal amount of brain anatomy.
Psy 5064	Brain and Emotion	3	Introduction to affective neuroscience. How brain promotes emotional/motivated behavior in animals/humans. Biological theories of emotion in historical/current theoretical contexts. Fundamental brain motivational systems, including fear, pleasure, attachment, stress, and regulation of motivated behavior. Implications for emotional development, vulnerability to psychiatric disorders.
Psy 5501	Vocational & Occupational Health Psychology	3	Survey of history, concepts, theories, methods, and findings of vocational/occupational health psychology. Burnout, personality, violence, stressors/stress-relations, counter productive behaviors, coping in workplace. Vocational development/assessment, career decision-making/counseling, person-environment fit.
Psy 5708	Organizational Psychology	3	Psychological causes of behavior in work organizations. Consequences for individual fulfillment and organizational effectiveness. Individual differences, social perception, motivation, stress, job design, leadership, job satisfaction, teamwork, organizational culture.
Psy 5862	Psychological Measurement: Theory and Methods	3	Types of measurements (tests, scales, inventories) and their construction. Theory/measurement of reliability/validity.
Psy 8041	Proseminar in Perception	3	Seminar. Advanced topics in auditory and visual perception. Lecture, discussion, and student-led presentations of research papers on core topics of the peripheral visual and auditory systems, cortical representations, behavioral and brain-imaging methods, and computational approaches to understanding/simulating perception.
Psy 8042	Proseminar in Cognition, Brain, and Behavior	3	Advanced topics in cognition, brain, and behavior. Lecture, discussion, and student-led presentations of research papers on core topics of attention, memory, emotion, categorization, thinking, and language, and intersections between these areas.
Psy 8201	Social Cognition	3	Social psychological theory/research on social inference and reasoning processes. Psychology of prejudice/stereotyping.
Psy 8814	Analysis of Psychological Data	4	Data-analytic procedures used in psychological research. Types of variables used in psychological research. Data collection designs, their limitations. Procedures for analyzing experimental/non-experimental data, both univariate and multivariate. Emphasizes selection of data-analytic procedures. Procedures and their assumptions. Computation using statistical software. Limitations, interpretation. Lecture, lab.

Course	Title	Credits	Description
Psy 8815	Analysis of Psychological Data	4	Data-analytic procedures used in psychological research. Types of variables used in psychological research. Data collection designs, their limitations. Procedures for analyzing experimental/non-experimental data, both univariate and multivariate. Emphasizes selection of data-analytic procedures. Procedures and their assumptions. Computation using statistical software. Limitations, interpretation. Lecture, lab.
Psy 8960	Graduate Seminar in Psychology: Multivariate Statistics for Social Scientists (ONLY this topic)	3	Graduate Seminar: Only Multivariate Statistics for Social Scientists approved for Human Factors & Ergonomics students.
PubH 6120	Injury Prevention	2	Injury epidemiology: analyses of major injury problems affecting the public in the workplace, community, and home using epidemiologic model and conceptual framework; emphasis on strategies/program development for prevention and control.
PubH 6140	Occupational & Environmental Epidemiology	2	Principles/concepts in identifying health effects in workplace. Strategies for identifying excess risk, evaluating strengths/weaknesses of research techniques, assessing bias/confounding.
PubH 6341	Epidemiological Methods I	3	Subject matter science, research methodology. Study designs applied to human populations. Randomized trials. Four types of observational studies: cohort, case-control, cross-sectional, ecological. Causal inference, bias, effect modification.
PubH 6342	Epidemiological Methods II	3	Methods/techniques for designing, implementing, analyzing, and interpreting observational epidemiologic studies, including cohort, case-control, and cross-sectional studies.
PubH 6343	Epidemiological Methods III	4	Analysis/interpretation of data from various epidemiological study designs. SAS used to demonstrate epidemiological/statistical concepts in data analysis.
PubH 6470	SAS Procedures & Data Analysis	3	SAS procedures, how they are used in various health-related datasets to answer specific problems regarding estimation, testing, or prediction.
PubH 6806	Principles of Public Health Research	2	Evaluation of public health research literature and planning for independent research projects. Formulation of research question, research design, sampling techniques, use of research concepts, and data analysis. Data collection techniques, including questionnaires, interviews, and data analysis.
PubH 7406	Advanced Regression & Design	4	Single and multifactor factor ANOVA, normal theory random effects models, mixed models, diagnostics, non-parametric alternatives to ANOVA, multiple comparisons, power and sample size determination. ANOVA in regression notation. Elements of experimental design. SAS and R are used.

Course	Title	Credits	Description
Soc 8412	Social Network Analysis: Theory & Methods	3	Introduction to theoretical/methodological foundations of social network analysis. Concepts/principles, measurements, computer techniques. Applications to friendships, communities, work teams, intra-/inter-organizational relations, international systems. Focuses on network visualizations.
Stat 5021	Statistical Analysis	4	Intensive introduction to statistical methods for graduate students needing statistics as a research technique.
Stat 5303	Designing Experiments	4	Analysis of variance. Multiple comparisons. Variance-stabilizing transformations. Contrasts. Construction/analysis of complete/incomplete block designs. Fractional factorial designs. Confounding split plots. Response surface design.
Writ 4501	Usability & Human Factors in Technical Communication	3	Principles/concepts of human factors/usability testing. Developing objectives, criteria, and measures. Conducting tests in lab, field, and virtual environments. Using software programs to analyze qualitative/quantitative data.
Writ 8520	Seminar in Scientific & Technical Communication	3	Principles/concepts of human factors/usability testing. Developing objectives, criteria, and measures. Conducting tests in lab, field, and virtual environments. Using software programs to analyze qualitative/quantitative data.

Human Factors and Ergonomics is an interdisciplinary graduate program with faculty and classes from across the University.