The BCPE® Educational Coursework Requirement

REQUIRED CATEGORIES AND TOPICS	COURSE OBJECTIVE and EXAMPLE OF COURSE TOPICS	ACADEMIC CREDIT HOURS REQUIRED*
A. Basic Principles		**3 credit hours total**
1. Systems Concepts	*Objective:* Overall system approach: To recognize the integrated (systems) nature of the field, the centrality of human beings, to use its breadth of coverage and the available knowledge base to adapt the environment to people *Example topics:* Structure and dynamics of systems: general and sociotechnical systems theory; human as a system component; human system integration; integrated view of human characteristics (physical, psychological, social) in system development; systems analysis and design; human role in automation	At least 1 credit hour
2. Design Concepts	*Objective:* Principles underlying designing a system: To be able to translate general design principles, standards, guidelines and regulations into project specific requirements to which one can design. *Example topics:* Use-centered/user-centered design, ergonomic/human factors impacts on the product-design cycle, universal design, design for individuals vs. populations, aesthetics vs. functionality.	At least 1 credit hour
B. Core Background		**6 credit hours total**
1. Human Attributes 1.1 Anthropometry & Demography	*Objective:* To recognize the physical (anthropometric) and cultural characteristics and differences between people with particular reference to health, safety, comfort and performance. *Example topics:* Anthropometry, gender, culture, developmental (childhood, aging, disabilities), and ethnic variables relevant to design decisions.	At least 2 credit hours
1.2 Physiology & Biomechanics	*Objective:* To recognize the physical characteristics of people and their responses to their activities and their environments with particular reference to health, safety, comfort and performance. *Example topics:* Biomechanics, functional anatomy, and posture; energy and force production, physiological and postural adjustments to stress and workload; circadian rhythm.	

1.3 Psychology	*Objective:* To recognize behavioral characteristics and responses, and to understand how these affect human behavior (including health, performance, and quality of life), and attitudes. *Example topics:* Psychophysics, perceptual and cognitive aspects of information processing, perception-action analysis (motor skills and learning, proprioception, SR compatibility), human performance/error analysis, vigilance, situation awareness, macrocognition, decision making (formal and naturalistic), impact of motivation, and human development.	
2. Environmental Context 2.1 Physical Environment 2.2 Social Environment 2.3 Organizational Environment	 *Objective:* To understand the human responses to attributes of the physical environment. *Example topics:* Climatic environments, perceptual environments including: visual, acoustic, tactile, proprioceptive, motion sensing, vibration and habitability *Objective:* To recognize the impact of social dimensions on the system to achieve a good quality of life and performance. *Example topics:* Psychosocial factors, motivation and attitudes formed through group cultures and how these impact individual performances; individual and group contributory performances, distributed cognition. *Objective:* To recognize the impact of organizational culture and related structure, practices, policies and procedures on the system to achieve a good quality of work-life and performance. *Example topics:* The overall impact of social-technical systems on performance outcomes; macroergonomics.	At least 2 credit hours
C. Core Methodology: Analysis & Design of Processes & Products		**6 credit hours total**
1. Statistics and Design of Investigations	*Objective:* To understand, select and use the appropriate methods for investigating ergonomics and human factors issues, and present data to assess future design solutions. To measure, collect, aggregate, manipulate and assess data in a reliable and valid manner. *Example topics* (Statistical and Research Methods): Descriptive and inferential statistics; correlation and regression analysis techniques, estimation and sampling; experimental design including field methodologies; non-parametric statistics, and use of confidence intervals. *Example topics* (Measurement): Reliability and validity (internal and external), physical instrumentation, and psychological measures (questionnaires, interviews, surveys, psychophysical and psychophysiological methods). Epidemiology basics	At least 2 credit hours

2. Basic Process Analysis	*Objective:* To understand the major methods and procedures used in investigations of user activities and work processes (physical and cognitive) and to know when to use them and how to interpret results. *Example topics:* Cognitive work analysis, functional analysis, task analysis, simulations, physical and cognitive model development, activity and performance analysis; subjective methods, including questionnaires, surveys, and heuristic analysis; epidemiological approaches; sampling techniques; and appropriate use of ergonomic and usability guidelines, regulations, and standards.	At least 1 credit hour
3. Design Methods	*Objective:* To understand the techniques and procedures used in the design process and how ergonomic/human factors input to the process can be most effectively achieved. *Example topics:* Product design cycles, design standards and specifications, design for manufacturing and maintainability, user-centered design, iterative design, prototyping and participative design.	At least 1 credit hour
4. Basic Usability	*Objective:* To understand the basic methods and procedures used to assess and analyze usability of products, systems, and processes. *Example topics:* Heuristic analysis, usability engineering, usability testing, universal design, user experience assessment and accessibility assessment.	At least 1 credit hour
D. Application of Analysis, Design, Validation & implementation Methods		**8 credit hours total**
1. Human-Machine Interaction	*Objective:* To understand and apply the information available relating to analysis and design of human machine interfaces (including controls, displays, workspace arrangement and seating) to reduce human error, decrease human workload, and enhance human health, comfort, safety and productivity. *Example topics* (Basic Knowledge): Controls and displays design principles, specifications, and methods; workplace/workstation design; perception-action analysis; S-R compatibility assessment; functional anthropometry; biomechanical modeling of working postures; physiological methods (e.g., electromyography, goniometry); psychophysical methods; epidemiological analysis of risk factors; workplace assessment tools (e.g., NIOSH lifting guide, risk factor surveys). *Example topics* (Application): Application of functional anthropometry to design, reach envelopes, controls, and displays; application of postural and biomechanical modeling tools, workplace assessment instruments (e.g., NIOSH), and physiological workload assessment data to design. Management of occupational injuries and disorders. Application of accessibility guidelines for people with disabilities. Application of appropriate ergonomic standards and guidelines on workspace design and organization (e.g., OSHA, ANSI, HFES, ISO, DOD, and NASA).	At least 1 credit hour in 3 of the 5 areas of Human Interactions

2. Human-Environment Interaction	*Objective:* To understand the information available and methods to analyze and design human-environment interfaces (including illumination and glare, heat, cold, noise, vibration, and air quality) to reduce human error, decrease human workload, and enhance human health, safety, comfort and productivity. *Example topics* (Basic Knowledge): Lighting and glare measurement, measurement of noise with respect to impacts on hearing loss, communication, and annoyance; assessment of temperature with respect to impacts on human physiological and psychological function; assessment of vibration with respect to impacts on human physiological and psychological function; techniques (metabolic, physiological, psychophysical) for assessment of physical and mental fatigue related to environmental stressors and shift work. *Example topics* (Application): Application of appropriate standards and guidelines relating to task-appropriate illumination and avoidance of glare (e.g., IIE, CIE, ANSI and DOD); hazardous levels of environmental noise as well as levels of noise, which interfere with communication (e.g., OSHA, EPA, ANSI, ISO and DOD); avoidance of heat and cold stress (e.g., ASHAE, OSHA, and NIOSH); avoidance of stress related to vibration (e.g., ISO).	At least 1 credit hour in 3 of the 5 areas of Human interactions
3. Human-Software Interaction	*Objective:* To understand the information available and methods to analyze and design cognitive components of human-software interfaces to reduce human error, decrease human workload, and enhance human safety, comfort, and productivity. *Example topics* (Basic Knowledge): Usability engineering tools, mental workload assessment tools, cognitive engineering, cognitive task analysis and design, ecological interface design, situation awareness assessment, user models. *Example topics* (Application): Application of design principles related to design of user interfaces. Includes display (visual, auditory and tactile) elements; navigation; task flow; situation awareness; mental workload; situated and distributed systems; information overload; design aesthetics; input and output devices.	At least 1 credit hour in 3 of the 5 areas of Human interactions
4. Human-Job Interaction	*Objective:* To understand the information available and methods to develop work modules and combine modules into jobs to make them intrinsically motivating, better utilize human capabilities, avoid stress and injury. *Example topics* (Basic Knowledge): Task analysis; job appraisal; aptitude testing; work methods and human performance measurement (including cost-benefit analysis); work module design; needs assessment for instructional design; team assessment; reliability and error analysis. *Example topics* (Application): Application of design principles from literature on job appraisal; aptitude testing; work methods measurement; instructional design; knowledge acquisition; and adult learning.	At least 1 credit hour in 3 of the 5 areas of Human interactions

5. Human-Organization Interaction	*Objective:* To understand the information derived from and methods used for macroergonomic analysis and design; that is, optimization of the overall structure and related process of the work system. *Example topics* (Basic Knowledge): Sociotechnical systems approach to work systems design. Cooperative analysis and design of new work systems; process design and re-engineering; basics and application of work schedules; and introduction of change. Application of macroergonomic analysis and design methods [e.g., Macroergonomic Analysis of Structure (MAS), MacroErgonomic Analysis and Design (MEAD), Computer Integrated Manufacturing, Organization, and People System Design (CIMOP), High Integration of Technology, Organization, and People (HITOP) analysis, TOP-Modeler]. *Example topics* (Application): Application of design principles derived from sociotechnical systems approach to work systems design. Cooperative analysis and design of new work systems; process design and re-engineering; basics and application of work schedules; and introduction of change. Includes focus on training as essential component of redesign rather than add-on. Management of safety and ergonomic programs, including consideration of socio-economic conditions.	At least 1 credit hour in 3 of the 5 areas of Human interactions
E. Professional Issues		**1 credit hour total**
	Objective: To understand the impact of ergonomics and human factors on people's lives, the costs and benefits accruing from ergonomics/human factors activities, the social and psychological impact of ergonomics/human factors investigations, and the professional responsibilities and requirements for the ergonomics/human factors practitioner — including professional ethics, and ability to communicate (verbally and in writing) with stakeholders. *Example topics:* Legislation, economics, return on investment, ethics, marketing, ergonomist's/human factors professional's role in organizations, society, and different interest groups.	

***Notes:**

- "Academic Credit Hours Required" are preferred to be from undergraduate or graduate courses by accredited** institutions. Acceptable academic courses can also be taken at an accredited* academic institution or its affiliate(s) (such as university "extension" or "continuing education"), and involves lectures and some type of student assessment (e.g., an examination or project).

- Acceptable continuing education units (CEUs) include: 1. CEUs that have been historically accepted by universities/colleges as "academic" credits/units; 2. CEUs offered through accredited universities extension/continuing education programs, and 3. CEUs offered by boards and professions related to our field and are approved by IACET (International Association of Continuing Education and Training).

  The CEUs assigned to a "short-course" are considered only with provision of official proof of enrollment, course content, contact hours, and assessment mode information. Attending a conference or symposium that offers CEUs for attendance are not considered educational CEUs and will not be counted towards the educational coursework requirement.

- Academic courses taken as “audit” need to be formally acknowledged by the providing institution (e.g., through transcript notation).
- Online courses (e.g., MOOCs such as Coursera, edX, and Udacity) are considered only with provision of official proof of enrollment, course content, contact hours, and assessment mode information.
- “Training” in areas related to the topics listed above does not constitute formal academic experience and will not be counted towards the educational coursework requirement.

**The BCPE considers a college or university to be acceptable when it holds institutional accreditation from an Accredited Board for Engineering and Technology (ABET) or the Council for Higher Education Accreditation (CHEA). International degrees will be deemed acceptable based on the institution’s accreditation status in the presiding education system.

Summary of Required Academic and Continuous Education Credit Hours for BCPE Application

CATEGORY	Academic Credit Hours (Semester)	Academic Credit Hours (Quarter)	CE Credit Hours*	Contact Hours**
A. Basic Principles	3	4.5	4.5	45
B. Core Background	6	9	9	90
C. Core Methodology: Analysis & Design of Processes & Products	6	9	9	90
D. Application of Analysis, Design, Validation & Implementation	8	12	12	120
E. Professional Issues	1	1.5	1.5	15
Total	**24**	**36**	**36**	**360**

*See above under **Notes** for acceptable CEUs.

****Note:** Each semester credit hour requires 15 contact hours. A CE credit hour is equivalent to one quarter credit hour and both require 10 contact hours. One semester credit hour is equivalent to 1.5 quarter or CE credit hours.

The comparison grid of units/hours is provided for convenience. A core background in HFE obtained primarily through training (versus education) programs is not acceptable.