



# BCPE EXAM SPECIFICATION

## Based on 2014 Job Analysis

The following exam specification lists the critical tasks necessary for an early career professional (minimum 3 years of experience) to show competence in order to be certified as a BCPE Professional. Under each task are listed knowledge and skills. These competencies are validated with percentages reflecting the importance of each area to practice. The exam content is balanced according to these percentages.

There are some important ideas that the wording of the core competencies currently reflects:

- *Human-centered design* or *design* applies to products, tasks, jobs, organizations and environments.
- *System* applies to recognizing and understanding how humans and non-humans interact and influence one another within an integrated whole.
- The term *user* implies both *individuals and groups* rather than single users to clarify to the reader that there are a variety of settings they may be faced with, and to reduce the potential for the reader to focus on the individual user.
- We used plural forms for products, tasks, organizations, and environments to encourage the idea that persons may be working on one or more aspects of a situation at a time.

Human Factors/Ergonomics discipline is characterized by the following\*:

- Takes a systems approach, therefore considers the broader context of the human in the environment even when focusing on a specific type of interaction.
- Is design driven, involving analysis and assessment resulting in recommendations and actions for design.
- Focuses on two related outcomes: performance and wellbeing, which includes efficiency and effectiveness and health and safety.

\* J. Dul et al. 2012 *A strategy for human factors/ergonomics: developing the discipline and profession*. *Ergonomics* 55:4, 377-395

## Overview

%	Competency Section	Tasks
34%	I ANALYSIS –discover, gather data	7
33%	II DESIGN – develop systems	7
24%	III VALIDATION – testing, evaluation	5
9%	IV IMPLEMENTATION – training, education, communication	2

%	Core Competency
34%	<p><b>I ANALYSIS –discover, gather data</b>  <b>Analysis determines the criteria for performance of humans in the context of system elements, such as products, tasks, jobs, organizations and environments.</b></p>
	<p>1. Conduct user research and/or evaluation to identify, document, and prioritize <b><u>requirements</u></b> for individuals and groups to achieve their goals.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Ergonomic design principles, regulations, guidelines, and standards, including those that focus on user accessibility</li> <li>• User research, usability testing, field projects, psychometric approaches, ecological and contextual analysis, observational methods, and performance metrics</li> </ul>
	<p>2. Identify and apply relevant <b><u>anthropometric data</u></b>, including applicable demographic and cultural attributes of individuals and groups, to develop design criteria.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Anthropometric, demographic, cultural, and human development attributes of the user population</li> <li>• Design criteria/strategies for anthropometric data (e.g., ‘design for the extreme’ or ‘design for fit’)</li> </ul>
	<p>3. Identify and employ relevant <b><u>organizational factors</u></b> impacting individuals and groups interacting within an organization, to produce recommendations to enhance quality of work life, safety, effectiveness and efficiency.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Fundamentals of organizational structure, organizational behavior and group dynamics, and principles of work</li> <li>• Macro-ergonomic analysis methods, sociotechnical systems theory, and methods for assessing work systems</li> </ul>
	<p>4. Identify and measure the relevant <b><u>physiological and biomechanical responses</u></b> of individuals and groups to their activities and environments with particular reference to health, safety, comfort and effectiveness and efficiency.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Biomechanics, physiology, functional anatomy, circadian rhythm effects, and adaptation to stress and workload</li> <li>• Physical measures and psychophysical/subjective measures</li> </ul>

	<p>5. Identify <b><u>cognitive, behavioral and social characteristics</u></b> and responses of individuals and groups that impact health, wellbeing, safety, performance, quality of life, attitudes, value belief systems, and motivation.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Cognitive task and error analysis methods</li> <li>• Cognitive function and process measurement methods, workload and situational awareness, social causation, network analysis, and assessment of teams</li> </ul>
	<p>6. Identify and apply methods of evaluation of <b><u>cognitive aspects of human-technology interfaces</u></b> to reduce human error, optimize mental workload, and enhance health, comfort, safety, effectiveness and efficiency.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Cognitive factors, performance metrics, and evaluation methods for design, systems, and human performance</li> <li>• Human-technology performance modeling, inspection methods, and participatory methods</li> </ul>
	<p>7. Identify and apply methods of evaluation of <b><u>physical aspects of human-technology interfaces</u></b> to reduce human error, optimize physical workload, and enhance health, comfort, safety, effectiveness and efficiency.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Performance metrics for human-technology interfaces, and evaluation methods for design, systems, and human performance</li> <li>• Measurement techniques in climatic and perceptual environments, analysis of risk factors, workplace assessment tools, and analysis of tasks, scenarios, user profiles, personas, and ROI</li> </ul>

33%	<h2>II DESIGN – develop systems</h2> <p>Design applies the criteria for development or change for desired performance of humans in the context of system elements, such as products, tasks, jobs, organizations and environments.</p>
	<p>1. Apply <b><i>ergonomic principles and data</i></b> appropriate to developing and fulfilling a set of requirements to achieve a safe, usable, effective, and efficient human centered design.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Ergonomics design principles, regulations, guidelines, and standards to fulfill design and user requirements</li> <li>• Human centered design techniques and process for conceptual, prototype, and operational model design alternatives</li> </ul>
	<p>2. Design the <b><i>hardware product</i></b>, which includes functions, information displays, interactions, communication modalities etc., within the constraints and capabilities, and context to enable individuals and groups to accomplish a particular set of goals.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Requirements, regulations, principles, guidelines, and standards for hardware design</li> <li>• Instructional, safety and warning systems design principles including perceptual environments</li> <li>• Controls and displays design principles, specifications, and methods</li> </ul>
	<p>3. Design the <b><i>software product</i></b>, which includes functions, information displays, interactions, communication modalities etc., within the constraints and capabilities of the hardware and the context to enable individuals and groups to accomplish a particular set of goals.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Requirements, regulations, principles, guidelines, and standards for software architecture and design</li> <li>• Software and systems design processes, including prototyping and iterative methods</li> </ul>
	<p>4. Design <b><i>tasks</i></b> within human capabilities and limitations, and the workplace context to enable individuals and groups to accomplish a particular set of goals, and manage stress and fatigue.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Designing for physiological, cognitive and biomechanical capabilities and limitations, and stress responses</li> <li>• Individual and group decision making (e.g. formal and naturalistic) and decision making strategies and assessment of teams</li> </ul>

	<p>5. Design <b><i>jobs</i></b> using systematic procedures, principles, and techniques in developing and combining tasks into jobs to make them safe, efficient, effective, and motivating, to better utilize human capabilities, and manage stress and fatigue.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Principles, guidelines, and regulations of job design, shiftwork and automation effects, and human performance measurement</li> <li>• Job and task analysis methods</li> </ul>
	<p>6. Design the <b><i>organization</i></b> within human capabilities and limitations, and the social context to enable to accomplish a particular set of goals, and manage stress and fatigue.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Organizational behavior, group dynamics and organizational theory</li> <li>• Design strategies to promote and facilitate individual, team and organizational processes</li> </ul>
	<p>7. Design the <b><i>environment</i></b>, within human capabilities and limitations, and the wider context to enable to accomplish a particular set of goals, and manage human stress and fatigue.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Environmental design principles, regulations, guidelines, and standards for indoor and outdoor spaces, tools, and equipment (e.g. acoustic, visual, noise, lighting, vibration, acceleration/deceleration, temperature)</li> <li>• Environmental effects on physiological and cognitive systems and responses, and human performance</li> </ul>

24%	<h3>III VALIDATION – testing, evaluation</h3> <p>Validation confirms effective design for desired performance of humans in the context of system elements, such as products, tasks, jobs, organizations and environments.</p>
	<p>1. Evaluate and design an existing <b><u>product</u></b> and related systems, for predictive, stable, reliable and effective products.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Test design and analysis methods for products and systems for determining if design criteria are met</li> <li>• Validation and re-design methods for products and systems</li> </ul>
	<p>2. Evaluate and design an existing <b><u>task</u></b> and related systems, for predictive, stable, reliable and effective tasks.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Test design and analysis methods for independent and integrated tasks and systems</li> <li>• Task assessment tools and human performance measurement techniques for evaluating task design and re-design</li> </ul>
	<p>3. Evaluate and design an existing <b><u>job</u></b> and related systems, for predictive, stable, reliable and effective jobs.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Test design and analysis methods for independent and integrated jobs and systems</li> <li>• Methods for evaluating human performance with respect to workload balance and structure</li> </ul>
	<p>4. Evaluate and design an existing <b><u>organization</u></b> and related systems, for predictive, stable, reliable and effective organizations.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Test design and analysis methods for organizations</li> <li>• Organizational analytics, performance metrics, and economic analyses</li> </ul>
	<p>5. Evaluate and design an existing <b><u>environment</u></b> and related systems, for predictive, stable, reliable and effective environments.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Test design and analysis methods for environments to ensure conformance with relevant regulations, guidelines and standards</li> </ul>

9%	<p><b>IV IMPLEMENTATION – training, education, communication</b></p> <p>Implementation manages incorporation of the design to attain desired performance of humans in the context of system elements, such as products, tasks, jobs, organizations and environments.</p>
	<p>1. Define the <b><i>integrative strategies</i></b> necessary to effectively and efficiently implement design.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Human centered design processes, instructional systems design, training and education processes, feedback processes and methods, and communication methods</li> <li>• Analytics and performance metrics for determining successful implementation</li> </ul>
	<p>2. Deliver <b><i>training/education</i></b> to support effective and efficient individual, group, and organizational adoption of design.</p> <p><b>Knowledge and skill in:</b></p> <ul style="list-style-type: none"> <li>• Instructional systems design, training and education processes, and communication methods</li> <li>• Methods for evaluating and/or measuring effectiveness and efficiency of development and delivery of training</li> </ul>