NCEES
advancing licensure for engineers and surveyors

## NCEES Principles and Practice of Engineering Examination
## ELECTRICAL AND COMPUTER—COMPUTER ENGINEERING CBT Exam Specifications

**Effective beginning with October 2025 examination**

- The PE Computer Engineering exam is computer based. It is closed book with an electronic reference.
- Examinees have 9.5 hours to complete the exam, which contains 85 questions. The 9.5-hour time includes a tutorial and an optional scheduled break. Examinees work all questions.
- The exam uses both the International System of units (SI) and the US Customary System (USCS).
- The exam is developed with questions that will require a variety of approaches and methodologies, including design, analysis, and application.
- The knowledge areas specified as examples of kinds of knowledge are not exclusive or exhaustive categories.

| | | Number of Questions |
|---|---|---|
| **1.** | **Data Representation** | **7–11** |
| | A. Number representation | |
| | B. Character representation | |
| | C. Encoding/decoding schemes | |
| | D. Error detection and correction | |
| | E. Data compression and decompression | |
| **2.** | **Computer Architecture** | **12–18** |
| | A. Computer system organization and processor design (e.g., memory, input/output devices, central processing unit, subsystem interfaces, special purpose processors, interrupt interfaces, power management, video, communication subsystem, life safety systems) | |
| | B. Embedded systems (e.g., I/O devices and system peripherals, interfacing and signal conditioning, applications, microprocessors and microcontrollers, fault tolerance/recovery, communication) | |
| | C. System architecture (e.g., power provisioning and management, distributed/parallel processing systems [e.g., cloud, IoT, IIoT, massively parallel processing (MPP)], reliability, availability, and maintainability, large-scale system design) | |
| | D. Memory systems (e.g., cache systems, virtual memory, memory hierarchy, performance metrics, storage systems [e.g., network access storage (NAS), storage area network (SAN), redundant array of independent disks (RAID)], addressing and expansion) | |
| | E. System performance (e.g., cycles per instruction [CPI], core utilization, power, bandwidth, speed-up, benchmarking, tuning and optimization) | |

**3. Systems Software** **9–14**

A. Operating systems
B. Real-time operating systems
C. Virtualization and containerization (e.g., microservices, resource-constrained functions)
D. Interrupts and exception handling
E. Firmware (e.g., unified extensible firmware interface [UEFI], basic input-output system [BIOS])

**4. Application Development** **8–12**

A. Software design (e.g., structured programming, design methodologies, state transition diagrams, requirements definition, fault tolerance, safety critical software, model-based systems engineering, development of security operations)
B. Quality assurance (e.g., testing, reviews and inspections, safety and security, validation and verification, root cause analysis)
C. Software fundamentals (e.g., data structures, algorithms, handshaking and synchronization, control flow constructs)
D. Development tools (e.g., debuggers, disassemblers and assemblers, trace tools, emulators, static analysis tools, code repositories)
E. Machine learning/artificial intelligence

**5. Digital Devices** **8–12**

A. Memory devices
B. Standard modular devices (e.g., multiplexers, demultiplexers, encoders, decoders, adders, flip-flops, arithmetic logic units [ALUs] and floating point units [FPUs])
C. Application-specific integrated circuits (ASICs) and programmable devices (e.g., field-programmable gate array [FPGA], programmable logic devices [PLDs], programmable logic controllers [PLCs])
D. Combinational and sequential circuits (including tri-state logic)
E. Synchronous and asynchronous sequential circuits
F. Design for testability (DFT) and testing
G. System design

**6. Digital Electronics** **8–12**

A. Basic solid-state devices
B. Operating parameters (e.g., fan-in, fan-out, loading, timing, noise and electromagnetic compatibility, thermal effects, voltage/current, power and energy management)
C. Data conversion and instrumentation (e.g., ADC, DAC, op amps, sensors and transducers [input], actuators, and indicators [output], signal conditioner)
D. Circuit implementation (e.g., static CMOS implementation, logic families, signaling standards [low-voltage differential signaling (LVDS), controller area network (CAN), etc.], current-mode logic)
E. Timing design and analysis (e.g., metastability, races, hazards, glitches, timing diagrams, clock generation, distribution, recovery, handshaking and synchronization)