



CLP-12-01 | CLP - C Certified Professional Programmer

Exam Syllabus (ver. 1.1, 2017)

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1. Evolution of C – from past to eternity

- milestones: ANSI C, C89, C95, C99, C11
- obsolete (but still valid) language elements
- how have function declarations changed over time?
- trigraphs and digraphs
- new C11 keywords:
 - `_Noreturn`
 - `_Alignof` and `_Alignas`
 - `_Bool`
 - `_Exit`
 - `_Complex`
 - `_Pragma`, `__func__`
 - `_Generic`

2. Handling variable number of parameters (<stdarg.h>)

- calling conventions, passing parameters, stack usage, stack frame, returning a value, recursion
- `va_start()`
- `va_arg()`
- `va_end()`
- `va_copy()`
- `vsprintf()`, `vprintf()`, `vfprintf()`
- `vscanf()`, `vsscanf()`, `vfscanf()`
- `(__VA_ARGS__)`

3. Low level IO (<unistd.h>)

- POSIX, API, ABI, WINAPI, etc.
- `access()`
- `open()`
- `errno`
- `close()`
- `read()`
- `write()`
- `lseek()`
- `dprintf()`
- `stat()`
- `symlink()`, `link()`
- `readlink()`
- `unlink()`
- `fcntl()`, `ioctl()`



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4. Memory and strings (<string.h> et al.)

- manipulating memory blocks
- string manipulation: `strchr()`, `strrchr()`, `strstr()`, `strtok()`
- `qsort()`, `bsearch()`
- `aligned_alloc()`, `calloc()`, `malloc()`, and `realloc()`
- `bcopy()`
- `memcpy()`
- `memccpy()`
- `memmove()`
- `bzero()`
- `memset()`
- `memcmp()`
- Internationalization I18N
 - Unicode, UCS, UTF-8 – how to deal with a multilingual environment?
 - universal character names
 - wide characters supported in different C dialects (`<wchar.h>`, `<wctype.h>`, ...)
 - `strcoll()` and `wscoll()`

5. Processes and threads

- definitions, implementations and history
- thread safety
- `system()`, `getenv()`, `setenv()`
- processes – the Unix way:
 - `fork()`
 - `exit()`
 - `execxx()`
 - `wait()` and `waitpid()`
- processes – the MS Windows way:
 - `CreateProcess()`
 - `WaitForSingleObject()`
- POSIX threads
- MS Windows threads
- C11 threads (`<thread.h>`)



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6. Floats and ints once again (<math.h>, <fenv.h>, <inttypes.h> et al.)

- IEEE-754: a different universe
- NaN, infinity, zero
- floats and doubles – should we trust them?
- numerical anomalies vs precision
- ULP
- what is a pragma?
- FENV_ACCESS pragma
- floating-point exceptions
- rounding
- multi-precision libraries (GMP, MPFR, MPIR)

7. Network sockets – the absolute basics

- what is a socket? what is a network socket?
- TCP/IP protocol stack, UDP
- connection and connectionless data transmissions
- servers and clients
- big- and little-endians and why you should be aware of them
- socket addressing: IPv4, IPv6, service numbers
- getaddrinfo()
- socket()
- connect()
- bind()
- listen()
- accept()
- send() and recv()
- a simple example of client-server communication
- a simple example of peer-to-peer communication

8. Miscellaneous

- const variables vs. volatile variables
- goto – why and why not, advantages, disadvantages and limitations
- long (non-local) jumps: setjmp() and longjmp()
- static array indices, designated initializers, compound literals, variable-length arrays, flexible array members, restrict keyword
- sequence points: why ++/-- may sometimes make you crazy
- the *asm* keyword
- portability issues and undefined behaviors

