

LED projects

- L1 - LED clock with the arms drawn with LEDs (at least 12x2 LEDs of 2 different colors to show hours and minutes)
- L2 - LED clock with the arms drawn with individually addressable WS2812 LEDs (12 strips of 3 LEDs showing 3 colors for hours, minutes, seconds)
- L3 - LED clock with 7-segment display, calendar and alarm
- L4 - LED binary clock, for example at 19.45.17 will be displayed as a 01 1001 . 100 101 . 001 111, so three or four LEDs are necessary for each of the six positions.
- L5 - LED binary clock, using WS2812 individually addressable LEDs, for example at 19.45.17 will be displayed as a 01 1001 . 100 101 . 001 111, so three or four LEDs are necessary for each of the six positions.
- L6 – Simon Says game
- L7 - 3D LED Cube, the patterns must be uploaded via serial port
- L8 - 3D LED Cube using WS2812 individually addressable LEDs, the patterns must be uploaded via serial port
- L9 - fan / bicycle wheel that displays a light pattern; by detecting the passage of a marker located on a radius of the circle in front of a magnetic sensor, stationary patterns can be made to appear, using a single line of LEDs (located on the radius of the circle). Instead of a wheel, a floppy disk / hard drive (out of order) can be used.
- L10 - same, for displaying the three arms of a clock using three color LEDs on a single radius of a disk that revolves
- L11 – audio spectrum analyzer (with FFT calculation) with display on a number of LED columns
- L12 – audio signal strength meter (VU-meter) with display on a bar of 10 WS2812 individually addressable LEDs
- L13 - roulette game
- L14 – digital clock with figures drawn on 7 segments made from WS2812 individually addressable LED strips
- L15 – display scrolling messages on a dot matrix LED display (16 columns x 8 rows). The message must be transmitted via serial port.
- L16 - display scrolling messages on a WS2812 individually addressable LED matrix (8x8). The message must be transmitted via serial port.
- L17 - Tic-tac-toe (X and 0), playable, with keyboard and 3x3 LEDs (either 9 bicolor LEDs or 9+9 LEDs of 2 colors) ; the human player plays with X, and the controller with 0. The keyboard will be as simple as possible
- L18 - Tic-tac-toe (X and 0), playable, with keyboard and 3x3 individually addressable LEDs; the human player plays with X, and the controller with 0. The keyboard will be as simple as possible
- L19 - Game of Life, a very popular animated pattern, find many examples on the Internet
- L20 – Hourglass with WS2812 individually addressable LEDs, using 2 triangles made of LEDs, and detection of turning over.
- L21 – Elevator simulator, with a battery of 3 elevators of around 5 floors each, using WS2812 individually addressable LEDs. At each floor except the first/last there must be 2 call buttons (up/down)

Games on a LCD display (alphanumeric with 2 or 4 rows, or graphical)

- J1 – guess-a-word
- J2 – Labyrinth/Maze (4 rows or graphical)
- J3 – Tennis (4 rows or graphical)
- J4 – Tetris (4 rows or graphical)
- J5 – Space invasion (4 rows or graphical)
- J6 - Golf / minigolf (4 rows or graphical)
- J7 – Snake (4 rows or graphical)
- J8 – Froggy (4 rows or graphical)
- J9 - Tic-tac-toe (X and 0), playable, with keyboard and LCD display; the human player plays with X, and the uC with 0. The keyboard will be as simple as possible
- J10 - maze with ball, sensitive to tilt (with accelerometer), simulated on a 4 row or graphical LCD; the ball should not “fall out” of the field

Miscellaneous projects

- D1 – digital thermometer, with Dallas DS1820 or LM35 sensor and display on a LCD or 7-segment display, together with a LED bargraph which displays the temperature in aprox. 5 deg. increments.
- D2 - barometer / altimeter, using a pressure sensor and LCD display. The value must be shown numerically and also on a bargraph drawn on the display
- D3 - electronic parrot (recording and playing back audio) using an external memory (SD card)
- D4 - colorimeter - the determination of the color of an object using 3 LEDs (R,G,B) and a photoresistor to measure reflection
- D5 - audio filters and effects for guitar, voice alteration, etc.
- D6 - digital ohmmeter with several ranges and auto-range
- D7 – direct digital synthesis (DDS) function generator (generates a signal based on the samples stored in memory)
- D8 - digital voltmeter and ampere meter with LCD / LED display with multiple voltage ranges and auto-range
- D9 - digital frequency+period meter with LCD / LED display
- D10 - thermometer using an external A/D converter chip such as ADC0804, etc
- D11 - temperature recorder using an SD / MMC card
- D12 – video camera orientation system with 2 motors, controlled with 4 keys or joystick

D13 - measuring and displaying electric power consumed in a 220V outlet
 D14 - DTMF generator keyboard
 D15 - morse generator, receiving the characters from the serial port
 D16 - ultrasonic sonar to determine the distance (implemented by yourself, not using a purchased module)
 D17 - bicycle computer (display distance, speed, etc. using a magnetic sensor).
 D18 - hourglass-clock with automatic rollover detection (LED or LCD display with 4x20 characters)
 D19 - automatic playback of musical scores by optical scanning of music paper (linear sensor with LED and phototransistor)
 D20 - infrared barrier (using modulated light so as not to be influenced by the ambient light) with two rays and automatic counting of people in the room at that time.
 D21 - burglar alarm system with multiple zones, keyboard and LCD display
 D22 - access system with fingerprint reader, as on laptops (the fingerprint module will be purchased by yourself); multiple fingerprints must be enrolled and used.
 D23 - access system with contactless card reader (card reader module must be purchased by yourself); multiple cards must be enrolled and used.
 D24 - stepper motor control, using a keyboard with a few keys for speed and direction control (the motor is given)
 D25 - parking meter with coins (at least 2 different coin values must be recognized) and time display
 D26 - music synthesizer keyboard with recording of songs
 D27 - guitar tuner
 D28 - generate and display messages on a VGA monitor
 D29 - OBD code reader (for car engine diagnostics)
 D30 - siren for police / firefighters / ambulance (minimum 3 selectable sounds)
 D31 - solar panel tracking the position of the sun, using a DC motor
 D32 - elevator control system, with a motor which ascends/descends a weight
 D33 - elevator control system for min. 4 floors and 3 elevators, the elevator will be simulated using LEDs or a LCD with 4 rows, placed vertically. At each floor except the first/last there must be 2 call buttons (up/down)
 D34 - 4 operation calculator, with 5x4 keypad and LCD or 7 segment display.
 D35 - data logger, with a number of sensors and data saved to RAM. The processor is in sleep mode and wakes up periodically using a timer.
 D36 - GPS with LCD display using a GPS module with serial output (purchased by yourself)
 D37 - interfacing with a PC mouse, with action of your choice, depending on how the user moves the mouse - display, sound, etc..
 D38 - interfacing with a PC keyboard (PS / 2) and display on an LCD, it will allow entry and editing of a text buffer on the LCD (insert, backspace etc)
 D39 - TV remote control transmitter (with keyboard)
 D40 - TV remote control receiver (with on screen display controls, possibly command of LEDs)
 D41 - Lead-acid/NiMH/NiCd/LiPo battery charger, controlled by the processor
 D42 - pedometer for displaying speed, distance and energy consumption for a pedestrian / runner
 D43 - solar cell automation; the emphasis is on creating a system (whose functionality must be specified) with very low power consumption, powered by a solar cell and using the processor sleep modes.
 D44 - bar code reader with short range, with LED-phototransistor pair
 D45 - weather station with data transmission to a PC (Temperature, wind speed, wind direction) via serial port
 D46 - accelerometer-based musical instrument (sound varies depending on the movement of the hand)
 D47 - musical instrument based on the interruption of optical beams
 D48 - MIDI music synthesizer
 D49 - measuring blood pressure (sphygmomanometer) with a microphone
 D50 - monitoring a patient's pulse via infrared LED+phototransistor (not by using a commercial pulse module)
 D51 - IR remote control for a toy car (purchased by you and modified)
 D52 - tester for Ethernet cables; must display either "cable ok" or the current wire map/open wires on 8 LEDs
 D53 - displaying images on the oscilloscope in XY mode, using two DACs
 D54 - electronic drums, with accelerometer to determine the force of the hit on the drum
 D55 - automatic level control of water in a bowl with a linear sensor (potentiometer) and mini-pump
 D56 - temperature control thermostat (programmable) in an enclosure (box), using a heating element and temperature sensor
 D57 - electronic cat feeder
 D58 - alcohol tester, with numerical indication + bargraph
 D59 - 5-in-a row, playable, with the serial port for keyboard input and display output on the terminal, similar to X and O (tic-tac-toe), but an area of approx. 10x10.

Notes

1) please contact me at ms@elcom.pub.ro if unsure about a project. You should also search the Internet for details and examples. Usually, everything which is NOT specified in the project's title is at your choice; the purpose of this class is to learn by doing, not to create a project with a very strict set of requirements.

2) obviously, some projects are more complex than others; choose according to taste and/or previous experience; all projects are eligible for the maximum grade. Some complex projects can be simplified, and vice-versa.