

List of possible subjects for a homework (max 3 pages, if possible with figures)

Projects		Applications	Student	Coworker(s)
1.	Arduino + temperature sensor	Principles		
		Specific application 1		
2.	Arduino + remote temperature sensor	Principles		
		Specific application 1		
3.	Arduino + temperature and humidity sensor	Principles		
		Specific application 1		
4.	Arduino + accelerometer sensor	Principles		
		Specific application 1		
5.	Arduino + smoke sensor	Principles	Achim Cristian	
		Specific application 1		
6.	Arduino + flammable gas sensor	Principles		
		Specific application 1		
7.	Arduino + alcohol sensor	Principles		
		Specific application 1		
8.	Arduino + carbon dioxide sensor	Principles		
		Specific application 1		
9.	Arduino + muscular activity sensors	Principles		
		Specific application 1		
10.	Arduino + hydrogen sensor	Principles		
		Specific application 1		
11.	Arduino + methane sensor	Principles		
		Specific application 1		
12.	Arduino + dust sensor	Principles		
		Specific application 1		
13.	Arduino + electric current intensity sensor	Principles		
		Specific application 1		
14.	Arduino + pressure sensor	Principles		
		Specific application 1		
15.	Arduino + bending sensor	Principles		
		Specific application 1		
16.	Arduino + infrared sensors	Principles		
		Specific application 1		
17.	Arduino + proximity sensor	Principles	Litan Virgil	
		Specific application 1		
18.	Arduino + light sensor	Principles	Andreea Coporiie (light sensor)	Alexandru Stanciu (piezo)
		Specific application 1		
19.	Arduino + piezo element	Principles	Alexandru Stanciu (piezo)	Andreea Coporiie (light sensor)
		Specific application 1		
20.	Arduino + light sensor (professional)	Principles		
		Specific application 1		
21.	Arduino + UV sensor	Principles		

		Specific application 1		
22.	Arduino + magnetic field sensor	Principles		
		Specific application 1		
23.	Arduino + Hall probe	Principles		
		Specific application 1		
24.	Arduino + Geiger counter	Principles		
		Specific application 1		
25.	Arduino + sound sensor (advanced microphone)	Principles		
		Specific application 1		
26.	Arduino + thermocouple	Principles		
		Specific application 1		
27.	Arduino + 3D printer			
28.	Arduino + voltage measurement			
29.	Arduino + current intensity measurement			
30.	Arduino + resistance measurement			
31.	Arduino + data acquisition (Python, + graphical representation)	Principles		
		Graphic tablet		
		Specific application 2		
32.	Arduino + data acquisition (Visual C#, + graphical representation)	Principles		
		Arduino + C#		
		Specific application 2		
33.	Arduino + data acquisition (LabView, + graphical representation)	Specific application 1		
		Specific application 2		
		Specific application 3		
34.	Arduino + data acquisition (other, + graphical representation)	Principles		
		Specific application 1		
35.	Arduino+ mini-sumo robot			
36.	Arduino + independent car		Andrei Tudorică	Kovari Andrei and Manea Andrei (An II)
37.	Raspberry PI + sensors			
38.	Arduino + servomotors			
39.	Arduino + Peltier element for temperature control			
40.	Arduino + ethernet			

41.	Electromagnetic Stimulator			
42.	Arduino +load cell			
43.	Arduino + Ultrasonic Sensor			
44.	Arduino + low pass filter			
45.	Arduino + high pass filter			
46.	Arduino + ADC (analog to digital converter)			
47.	Arduino + band pass filter			
48.	Arduino + DAC (digital to analog converter)			
49.	Arduino + Ops Amps. (operational amplifiers)			
50.	Arduino + oscilloscope			
51.	Arduino + DDS (direct digital signal) function generator			
52.	Arduino + Wheatstone bridge (for resistance measurement)			
53.	Arduino + capacitance measurement			
54.	Arduino + inductance measurement			
55.	Electromagnetic stimulator			
56.	Processing	The program +Arduino		
		Graphics		
		Web cam image acquisition + processing		
		Internet image acquisition + processing		
57.	Arduino + electric skateboard		Radu Matei Birle	
58.	Arduino + Bluetooth commanded car		Fodorut Ioan	Vezentan Paul

59.	Arduino + MORSE		Sabau Andrei (sensor)	Mahalean Mihai (LCD software+ hardware) Oltean Victor (MORSE cod) Farcas Cristian (hardware -LEDs, resistance, interconnecting)
60.	To be completed at student proposal			

**Links:**

<http://www.robofun.ro>

<http://www.dx.com>

<http://www.arduino.cc>

<https://processing.org>

## Essays

1. Methods of science research: Hypothesis, postulates, laws, theory.
2. Physical law should have mathematical beauty (P. A. M. Dirac).
3. Are physical experiments in laboratory just a reproduction of nature?
4. The highest, the smallest in the nature. The dimension of different things.
5. Why do we need of “Bureau International des Poids et Mesures (France)”?
6. How does the ant know the way home with no guiding clues on the desert plain?
7. Space measurement, from first measurements to GPS.
8. Time measurement, from a walk under the moon to the modern atomic clocks.
9. Motion as fundamental concept of human existence.
10. Speed measurements from smallest mobiles to light velocity.
11. High speed video camera can reveal interesting features of fast motion.
12. Gravitational mass versus inertial mass.
13. The physical problems of Egyptians pyramid builders.
14. Roller coaster and circular motion.
15. Ballistics and curvilinear motion.
16. Temperature measurements, from absolute zero to supernova.
17. Barometric formula for the air pressure.
18. Origin of the Universe.
19. Limits of the observable Universe.
20. The last three minutes of Universe.
21. Stephen Hawking’s short time history.
22. Strings theory of the Universe.
23. Black holes are indeed black?
24. The Entropy and Universal order. Perpetuum mobile.
25. Multiple Universes. Do we have a twin brother?
26. Is possible a time travel?
27. Wormholes, space folding and the future space travels.
28. Isaac Newton’s “Philosophiæ Naturalis Principia Mathematica”.
29. Kepler laws for the solar system.
30. Meteorites, asteroids orbiting around Earth and hypothesis of dinosaurian disappearances.
31. Galilean relativity versus Einstein relativity.
32. Special relativity: Michelson Morley experiment. The ether problem.
33. Special relativity versus star Bradley aberration of light.
34. Special relativity: The Lorentz-Einstein-Poincaré transforms.

35. Special relativity: The twins' paradox.
36. Special relativity:  $E = mc^2$  and mass variation with velocity.
37. Special relativity: The muon problem.
38. General relativity and the gravitational problem.
39. The dream of a final theory. GUT (general union theory).
40. Symmetry in the Universe. Is preferred the right handed to the left handed and matter to anti-matter?
41. Emmy Noether's Theorem: Time uniformity and the law of energy conservation.
42. Emmy Noether's Theorem: Space homogeneity and the law of linear momentum conservation.
43. Emmy Noether's Theorem: Space isotropy and the law of angular momentum conservation.
44. Satellite stability and geostationary satellites for telecommunications.
45. The physics of car accidents.
46. The car that runs with oil versus the car that runs on water.
47. The self-righting Segway Human Transporter.
48. Galilean fingerprint on the modern physics.
49. XXI century new physical experiments.
50. Mission to Mars: Did we land on the Moon.
51. Mission to Mars: Large g forces. Human mission problem versus automatic mission.
52. Mission to Mars: Trajectory of spacecraft.
53. Mission to Mars: Fuel problem.
54. Mission to Mars: Take-off problems.
55. Mission to Mars: Landing on Mars.
56. Mission to Mars: To be there on time.
57. Mission to Mars: Space baseball.
58. The physics of ice skaters.
59. Observation and applications of centrifugal inertial forces.
60. Observation of Coriolis inertial force. Equator experiments.
61. Sky-scrapers damped oscillations.
62. Resonance phenomena in Nature.
63. Nuclear Magnetic Resonance in medicine.
64. Lissajous figures: Application to cathodic oscilloscope and TV image encoding.
65. Wave interference in nature.
66. How can a building sink into the ground? The physics of earthquakes.
67. Sounds produced by musical instruments with strings.
68. Sounds produced by musical instruments with membranes. 2D interference patterns.
69. Sounds produced by musical instruments with air columns.

70. Wave superposition. Voice modulation and voice recognition.
71. Doppler Effect, a way to measure the Universe dilatation.
72. Physiological effects of infrasounds.
73. Generation of ultrasounds and ultra-acoustic applications.
74. Electrical discharges in gases.
75. Earth magnetic field and navigation from ancient times to modern well logging.
76. Maxwell equations and Finite Element Methods (FEM) analysis.
77. Electromagnetic waves: Radio waves and applications.
78. Electromagnetic waves: Micro-waves and applications.
79. Electromagnetic waves: Infrared e.m waves applications.
80. Electromagnetic waves: Ultraviolet e.m. waves and human protection.
81. Electromagnetic waves: Infrared spectroscopy applied in chemistry and biology.
82. Electromagnetic waves: X-ray diffraction and applications.
83. Electromagnetic waves: How can a solar explosion shut down a power-grid system?
84. The electric and/or magnetic field produced by brain activity.
85. The van Allen radiation belt of Earth.
86. Discovery of elementary particles.
87. Elementary particles accelerators.
88. The Cosmic Background Radiation.
89. Inside nucleus. Instead of atomic bombs better nuclear reactors.
90. High velocity trains. Magnetic levitation.
91. Schrödinger equations and Copenhagen interpretations of wave function.
92. Schrödinger cat's imaginary experiment.
93. Light spectra a method for remote study.
94. Tunneling microscope and atomic resolution images.
95. Holography and modern applications.
96. LASER applications in medicine.
97. LASER application in telecommunications.
98. Magnetic memories of PC.
99. The fan uses in PC's. Fast Cray supercomputers (Seymour Roger Cray).
100. Semiconductor applications in nowadays life.
101. High temperature superconductors and their applications.