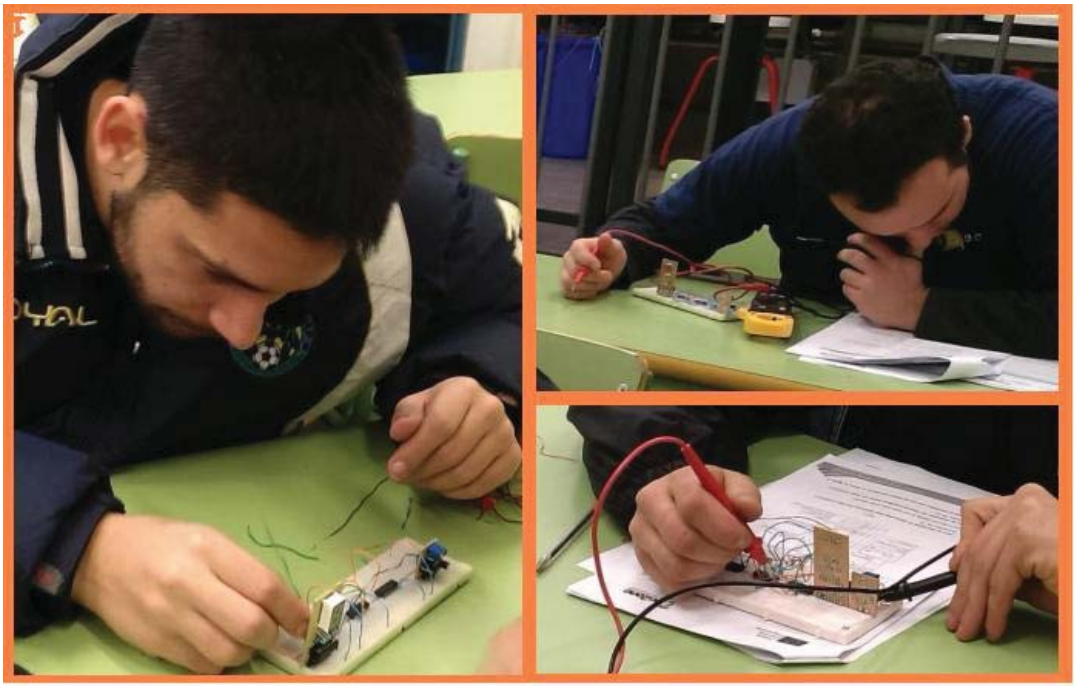
PROJECTX Nº 009

“IMPLEMENTATION OF DIGITAL FREQUENCY DIVIDERS”

PRESENTATION



Promoting school:

University of Pitesti
Pitesti. Romania

A. GENERAL DESCRIPTION

Title of the ProjectX

IMPLEMENTATION OF DIGITAL FREQUENCY DIVIDERS

Core area

GENERAL / KNOWLEDGE	**ELECTRICITY**
PARTICULAR / ACTIVITY:	**DESIGN, IMPLEMENTATION AND VERIFYING CIRCUITS**

Promoting school

UNIVERSITY OF PITESTI

Schools participants in the revision of the ProjectX

LYSEE ISAAC NEWTON VALDORIO UNIVERSITY OF PITESTI

Reference to ECVET Credit System and EQF / NQF

ECVET	EQF	REFERENCE TO NATIONAL QUALIFICATIONS (NQF)						
		Spain	Finland	Romania	Portugal	UK	Turkey	France
1	4	4	4	3	4	3	4	4

Learning Outcomes achieved (to be developed in the future related with ECVET credit system)

1. (ToPMoSt, ELIDS10) Using computer-based simulation software and technique to design electronics systems
2. (ToPMoSt, ELIDS02)Functional analysis of logic circuits
3. (ToPMoSt, ELIAS02)Building and installing electronics circuits and/or digital systems with the components required
4. Using reconfigurable circuits FPGA to implement small/medium digital circuits

Time that is necessary to do the ProjectX (in hours)

Theory:	8 hours
Practice:	12 hours

Link to real companies in your region (it is just informative)

1. NAME:S. C. LISA DRAXLMAIER AUTOPART ROMANIA S.R.L.	WORKPLACE: PITESTI
2. NAME: S. C. AUTOMOBILE DACIA S. A.	WORKPLACE:MIOVENI
3. NAME: S. C. CONTINENTAL AUTOMOTIVE SYSTEMS S.R.L.	WORKPLACE:SIBIU

B. THEORY

Objectives of the theoretical Knowledge

1. Improving Knowledge about flip flops (classification, symbols, truth tables, synchronous and asynchronous inputs) 2. Achieve solid understanding about counters as basic blocks of frequency dividers (classification, block diagrams, special facilities like parallel loading, typical applications) 3. Understand the relation between counters and frequency dividers 4. Design frequency dividers with asynchronous counters 5. Design programmable frequency dividers with synchronous counters

List of activities

1.Read theoretical materials to understand the flip-flops and counters 2.Read tutorials to learn how to design frequency dividers using counters 3. Read Data Sheet for circuits like 7474, 7473, 7493, 74192, 74193 and understand the functionality of each pin 4. Solve exercises 5. Evaluation of theoretical Knowledge

C. PRACTICE

Brief description of the Practice

Simulate digital circuits using dedicated software programs Implement and test counters and frequency dividers on breadboard using LSI and MSI logic circuits. Implement and test counters and frequency dividers in modern digital circuits such as CPLD or FPGA. Functional verification of the implemented circuits Use an oscilloscope to verify different types of frequency dividers (input/output signal visualization, input/output frequency determination, input/output voltage levels of each logic state) Functional verification of the implemented circuits

Steps or activities to be performed by the student

First: Simulate counters and different frequency dividers using TINA software program Second: Implement and test counters and different frequency dividers on breadboard using general purpose logic integrated circuits (such as 7474, 7473, 7493, 74192, 74193) Third: Implement and test counters and different frequency dividers in FPGA (using ISE WebPack Project Navigator software and Basys2 development board)

D. DETAILED DESCRIPTION OF LEARNING OUTCOMES.

Learning Outcome:	**(ToPMoSt, ELIDS10) Using computer-based simulation software and technique to design electronics systems**
Knowledge	
- Understand the advantage and disadvantage of circuits simulations	
Skills	
- Skills for circuit simulation: ○ draw the electrical diagram ○ choose the right type of analysis ○ display electrical signals in different points of electrical diagram - Skills for circuit design: ○ understand initial technical specifications ○ choose the right logic ICs ○ make right allocation of internal resources of the IC to cover all components of the logic diagram ○ make right connections for unused IC pins	
Competences	
- Simulate electronic circuits using dedicated computer programs - Use virtual instruments - Design electronic circuits using dedicated computer programs	

Learning Outcome:	**(ToPMoSt, ELIDS02) Functional analysis of logic circuits**
Knowledge	
- Deep Knowledge regarding sequential logic circuits	
Skills	
- make tests to verify the functionality of the circuit - make right connection between signal generator power supply and circuit - use oscilloscope to display the input/output electrical signals	
Competences	
- Proper use of laboratory equipment - Test simple and medium complexity circuits with general purpose logic IC - Test simple and medium complexity circuits implemented in FPGA	

Learning Outcome:	(ToPMoSt, ELIAS02) Building and installing electronics circuits and/or digital systems with the components required
Knowledge	
- Deep Knowledge about standard methodologies for design frequency dividers - Understand the advantage and disadvantage of different circuit implementation methodologies	
Skills	
- Skills for build the project: ○ make a bill of materials ○ identify the ICs needed to construct the schematic ○ make connection between pins - Skill for test the project: ○ check the correct realization of the electrical diagram	
Competences	
- Build simple and medium complexity circuits with general purpose logic integrated circuits (IC) - Implement simple and medium complexity circuits with modern digital integrated circuits such as CPLD or FPGA	

Learning Outcome:	Using reconfigurable circuits FPGA to implement small/medium digital circuits
Knowledge	
- understand concept of reconfigurable device - understand the advantage of reconfigurable device	
Skills	
- Skill for design the circuits: ○ make new project in according with available FPGA board ○ add new sources into project ○ draw the schematic of the divider ○ make constrains file (specify the input/output FPGA pins) ○ generate configuration file - Skill for implement and test the circuits: ○ download the configuration file into FPGA ○ make connection to the signal generator and power supply ○ make tests to verify the functionality of the circuit	
Competences	
- Use dedicated software environment to implement logic circuits in reconfigurable devices - Implement and test simple and medium logic circuit in CPLD/FPGA devices	