FIC PROJECT

MILESTONES:

Sesiunea 3 - S6 (2 puncte)

- Alegerea temei de proiect / set de instructiuni
- Specificarea echipei
- Impartirea rolurilor in echipa
- Nume echipa
- Bibliografie

Sesiunea 6 - S12 (maxim nota 7)

- Design Hardware & Documentatie GP (2p)
- Implementare General Purpose Processor (2)
- Testare General Purpose Processor (1)

Sesiunea 7 - S14 (maxim nota 10)

- Design & Implementare GP processor + ASIP; (1p)
- Testare ASIP (1)
- Prezentarea finala a proiectului - prezentare, documentatie (1)

Testarea core-ului se face implementarea unor aplicatii folosind setul de instructiuni propus tradus in cod masina folosind un assembler sau scrierea directa de cod masina.
(instruction file -> assembler/byte code -> memory -> execute instructions from memory)

Echipa:

- HW Design (2 persoane)
- Development (2-4 persoane)
    - Developer (2-3)
    - Testing and QA + UX (1)
- Project Manager (1 persoana) : team management, impartire pe taskuri, timeline, prezentari

General Purpose Processor (16-bit)

- Registers:
    - 16-bit Accumulator;
    - 2 16-bit general purpose (GP) registers: X and Y;
    - 4-bit Flag register: Zero, Negative, Carry, Overflow
    - 16-bit stack pointer

    - Program Counter
- Instruction size: 16-bit
- Word size: 16-bit
- Stack grows inverse in memory.

Core instruction set:

- Instruction size: 16-bit:
    - 6-bit opcode
    - 1-bit Register address
    - 9-bit Immediate size

Memory instructions: Load, Store into registers X or Y

Opcode	Register Address	Immediate
6 bit	1 bit	9 bit

Branch instructions:

- BRZ = branch if zero
- BRN = branch if negative
- BRC = branch if carry
- BRO = branch if overflow
- BRA = branch always (unconditional branch)
- JMP = call procedure
- RET = return from procedure

Opcode	Address
6 bit	10 bit

CALL/JMP push PC on stack. All procedure parameters are passed using stack.
RET pop PC from stack. Return value is passed using stack.

Arithmetic and Logic Instructions:

- **ADD**
- **SUB**
- **LSR**
- **LSL**
- **RSR**

- **RSL**
- **MOV**
- **MUL**
- **DIV**
- **MOD**
- **AND**
- **OR**
- **XOR**
- **NOT**
- **CMP**
- **TST**
- **INC**
- **DEC**

Opcode	Register Address	Immediate
6 bit	1 bit	9 bit

Only arithmetic and logic instructions should update the Flag register!

Minimum required CPU Components

- 2 general purpose registers: X, Y, and one accumulator A
- ALU
- Control Unit
- Instruction and Data memory (includes Stack)
- Sign Extend unit
- Processor registers: PC, SP, Flag

Application-Specific Instruction Set Processor (ASIP)

1. Come up with instructions for specific cores
2. Required for the final Milestone.

Possible applications (can come up with other ideas):

1. Calculator de buzunar
2. Operatii cu tensori
3. Floating Point Coprocessor
4. Cryptographic core
5. Crypto currency mining (hashing) core