SYLLABUS

Discipline Name	Digital Signal Processors
Profile	Electronics and Telecommunications Engineering
Specialization	Telecommunications Technologies and Systems
Code	51325409-2
Course leader	Professor Eugen LUPU, Ph.D. - Eugen.Lupu@com.utcluj.ro
Collaborators	Assistant Simina EMERICH - Simina.Emerich@com.utcluj.ro
Department	Communications
Faculty	Electronics, Telecommunications and Information Technology

Sem.	Type of discipline	Course	Applications			Course	Applications			Ind. study	TOTAL	Credits	Form of assessment
		[hours/week]				[hours/semester]							
			S	L	P		S	L	P				
8	**Speciality, Optional**	**2**	**-**	**1**	**1**	**28**	**-**	**14**	**14**	**64**	**120**	**4**	**Verification**

Acquired competences :
Acquired skills (what the student is able to do):
- To know the basic processing architectures - To know the addressing modes and usual instruction of Texas Instr. conventional DSP - To know the improved DSP families architectures C5000,C2000 si C6000
Acquired abilities (what type of equipment/ instruments/ software the student is able to handle):
– To employ developing tools (Assembler, C Compiler, CCS IDE) – To develop applications using the TI DSP families, employind the studied platforms and tools – To implement applications using the usual digital signal processing algorithms (FIR,IIR,signal generation,...) – To develop an application starting from the requests and teoretical solution to implementation

Prerequisites (if necessary):
Knowledge about : Microprocessors, Assembly and C language programming, Digital signal processing

A. Course/Lecture (course/lecture titles)	
1	Parallelism in Digital Signal Processing. Processing Architectures (von Neumann, Harvard, SISD,…). Special Architectures used in Digital Signal Processing.
2	Digital Signal Processors. Parallelism in data processing. The Current DSP Architectures. Alternatives to DSP Processors . DSP benchmarking.
3	Digital Signal Processing. Main DSP core algorithms (FIR, IIR, Convolution, Correlation, FFT)
4	Fixed and Floating Point DSPs. Texas Instruments TMS320 Digital Signal Processor Families.
5	Fixed Point TI Processors . The TMS320C2X Family. TMS320C25 – Overview. Pins and signals. Internal Architecture. Arithmetic and Logic Unit. Auxiliary Registers.
6	Addressing Modes (immediate, direct, and indirect). FFT Algorithms. "Bit-reverse" Addressing. C2x Instruction Set. Classification. Representative instructions (MAC).
7	Applications Development on C2x. The use of timer and interrupt system. Signals Generation. FIR Filter implementation. Examples.
8	Evaluation. Test 1.
9	TMS 320C5X Family. Architecture improvements. Addressing Modes. Instructions Set.
10	TMS320C54x and C55x Families. Architecture improvements. New applications fields.
11	The TMS320C5416 DSP. Architecture. Memory Map. Interrupt System. Peripherial Devices.
12	Addressing Modes. Instructions Set. - Code Composer Studio. Applications.
13	Signal Controllers. TMS320F2812. Internal Architecture. Memory, peripherials, intrerrupts.
14	DSP Performance Architectures. VLIW Architecture - presentation. Pipeline. TMS320C6X Family.

B1. Application – LABORATORY (labs work, seminar topics, year project contents)	
1	Numbers representation. Fixed Point Representation (Qx, IQ Format).
2	Applications on Sideral Board TMS320C25. FIR, IIR Filters. Sinus Signal Generator.
3	Application Development using CCS. Examples.
4	DSK C5416 Board. Presentation. Resources. Signals Acquisition.
5	Applications using DSK C5416 . DSP Starter Kit - Presentation. Resources. Signals Acquisition
6	Applications using DSK C5416 - DTMF tone detection techniques and the Goertzel algorithm
7	Applications using DSK C5416 - A GMSK Modulator Implementation
	PROJECTS

SYLLABUS

1	Request: the topic, content and project structure.
2	Documentation and familiarization with software development tools and boards
3	To establish the applications diagram. Applications Development on the provided platforms.
4	Testing. Project presentation and evaluation.
	Project examples: Applications developement on DSK 6713/2812/5416 using CCS; Implement several DSP applications on MATLAB (62x,64x,67x)

C. Individual study (reference study contents, synthesis materials, projects, applications etc.)

1. DSP roadmap - *evolution_dsp.pdf* (syntesis material), on site: www.bdti.com
2. DSP benchmarks - *benchmk_2000.pdf* (syntesis material)
3. VLIW DSP evaluation - *vliw_icspat00.pdf* (syntesis material)
4. DSP versus GPP. *mpu_vs_dsp.pdf* (study material)
5. Digital filters. *digfilt.pdf* (study material)

Individual study structure	Course study	Problem solving, laboratory, home works	Applications preparation	Examination time	Additional reference study	Total no. of individual study hours
Hours	20	20	10	2	12	64

References (Textbooks, courses, laboratory manual, exercise book)

1.Lupu, E. s.a *Procesoare digitale de semnal . Familia TMS320C2X.Prezentare si aplicatii,* Ed. Promedia 1996
2.[***] TI User Manuals TMS320C2x, TMS320C5x, TMS320C54x, TMS320C62x
3. [***] www.ti.com
4. Nedevschi, S. *Procesoare de semnal curs,* UT Pres 1997
5. Arsinte, R. – *Arhitecturi paralele şi procesoare de semnal*, Ed. Politehnica Timişoara 2000
6. [***] www.bdti.com
7. Smith, S. W. The Scientist and Engineer's Guide to Digital Signal Processing , www.DSPguide.com
8. Marven, C. , Ewers, G. *A simple approach to DSP* Texas Instr. 1993

On-line references

Eugen Lupu http://users.utcluj.ro/~elupu/ro_Cursuri.htm

Final evaluation	
Evaluation method	Written tests (E): problem solving (75%) and theoretical subjects (25%). (2 h).
Mark components	Test (T); Laboratory (L); Final Mark (N); Project (P);
Mark computation	N=0,6T+0,1L+0.3P; N≥5; P≥4.5; T≥4.5

Course leader,
Professor Eugen LUPU Ph. D.