



AGREED

Educational programs department

_____ / A.V. Doroshin /

" ____ " _____ 20 ____

APPROVED

Pro-rector for Academic Affairs

_____ / V.N. Matveev /

" ____ " _____ 20 ____

MODULE

Name of module (discipline)

DSP processors and hardware

Cycle	Professional stage		
Part of cycle	VARIABLE		
Code curriculum	110401.68-2014-O-III-2r00M-01		
Faculty	5		
Department	Lasers and bioengineering		
Rate	6		
Semester	B		
Lectures (SL)	20		
Seminar and practical employment (SP)	0	Exam	B
Laboratory researches (SLR)	20	Setoff	
Control of independent work (KSR)	0		
Independent work (SRS)	23		
In total with exams	108		

Name of the basic educational standard

11.04.01 Радиотехника (GNSS receivers. Hardware and software)

Module (discipline) developers confirm correspondences of the contents of the module (discipline), the conditions of implementation, support of the study process to requirements of basic educational standard.

Developer:

Kornilin D. V., associate professor., candidate

Head of department:

Zakharov Valeriy P., professor, doctor of science

Content of module (discipline) were discussed at the meeting Lasers and bioengineering

Protocol # ____ " ____ " _____ 20__

1 Aims and objectives of module (discipline)

1.1 Competences

PC - professional competence (Коды компетенций из ФГОС-3 " Радиотехника (GNSS receivers. Hardware and software)" 11.04.01: ПК-1, ПК-2, ПК-3, ПК-4, ПК-5, ПК-6, ПК-8, ПК-9, ПК-11, ПК-12, ПК-17, ПК-18)

1.2 Aims and objectives of module (discipline)

Discipline "DSP processors and hardware" covers a wide range of aspects related to circuit and system development for digital signal processing. The course is the basis for the implementation of theoretical and practical knowledge in circuit design and building algorithms for DSP microcontrollers, as proper components of modern DSP systems. The main objectives of the discipline are: 1 Creating the theoretical background for students in order to help them in further studying and designing in the field of microprocessor devices for DSP. 2 Developing practical skills of circuit design based on scientific methods for the synthesis of digital devices and developing algorithms for DSP microprocessors and microcontrollers. 3 To introduce students to modern debugging tools, devices and development boards in the area of DSP. 4 Developing skills in the area of the control and data acquisition based on microcontrollers, as well as the ability to apply algorithmic techniques for signal processing

1.3 Requirements to the final level of the students competences

Students, completed the course have to know: Basic structure of modern microprocessors and microcontrollers, used for DSP. be able: to develop hardware and software of DSP systems.

1.4 Links with previous modules (disciplines)

To learn the course successfully, students are to preliminary complete following courses: 1) Basics of electrical circuit design 2) Basics of boolean algebra 3) basics of computer programming 4) Basics of DSP algorithms

1.5 Links with following modules (disciplines)

The skill and knowledges, accepted after the completion of the course are necessary for learning course "Positioning calculations" and also for the master's dissertation writing.

2 Contents of the module (discipline)

Семестр 1		
СЛ 0,1852 20 часов 0,5556 ЗЕТ	Активные 0	
	Интерактивные 0	
	Традиционные 1	Digital Signal Processors
		Digital Signal Processors from Analog Devices

		Computational units: numeric processing for DSP and general control algorithms
		Memory architecture: hierarchical memory model. Data Address Generators (DAGs)
		Program sequencer: branches and sequencing
		DSP peripherals. Timers and Real-Time Clock (RTC)
		Operating modes and states
		Hardware and system design information
		Real Time Operating System: VisualDSP++ Kernel (VDK)
СП 0 0 часов 0 ЗЕТ	Активные 0	
	Интерактивные 0	
	Традиционные 0	
СЛР 0,1852 20 часов 0,5556 ЗЕТ	Активные 1	FIR filter
		IIR filter
		FIR based Decimation and Interpolation
		FFT algorithms
	Интерактивные 0	
	Традиционные 0	
КСР 0 0 часов 0 ЗЕТ	Активные 0	
	Интерактивные 0	
	Традиционные 0	
СРС 0,213 23 часов 0,639 ЗЕТ	Активные 0,5	FIR development based on Blackfin processors. There are individual tasks for each student
		IIR development based on Blackfin processors. There are individual tasks for each student
		FIR based Decimation and Interpolation development based on Blackfin processors. There are individual tasks for each student
		FFT algorithms development based on Blackfin processors. There are individual tasks for each student
	Интерактивные 0,5	
	Традиционные 0	

3 Innovative training methods

1. Using of the modern specific software and hardware, intended for the development and debugging of microcontroller's systems. 2. Performing trainings in the remote educational system MOODLE

4 Technical tools and material support of educational process

1. Lab with computers and development boards. 2. Software for developing and debugging DSP code

5 Methodical support of module (discipline)

5.1 Main literature

1. Embedded Signal Processing with the Micro Signal Architecture. Woon-Seng Gan and Sen M. Kuo Professor Published Online: 1 AUG 2006. DOI: 10.1002/9780470112274.app42. Dedicated Digital Processors: Methods in Hardware/Software System Design. F. Mayer-Lindenberg Published Online: 10 FEB 2004 Print ISBN: 9780470844441 Online ISBN: 9780470092842 DOI: 10.1002/047009284X

5.2 Additional literature

1. Emmanuel C. Efeachor, Barrie W Jervis. Digital signal processing. A practical approach. 2nd edition. Copyright Addison Wesley 2002. Proakis J.G. Digital Communications. Copyright McGraw Hill, 1995.

5.3 Electronic sources and Internet resources

1. www.rtfmoodle.ru 2. www.amber.ssau.ru 3. www.analog.com 4. www.ti.com

5.4 Guidelines and recommendations

During every term student's knowledges are monitored via remote automatic control system MOODLE. To be admitted to the exams, student has to perform all laboratory trainings, including individual tasks and pass all MOODLE tests. Poor test results and some unmade individual tasks don't limit students in passing exams, but can cause additional questions (task) on the exam. Examination is performed under rules of final and current control of student's knowledges, signed by university rector. Examination resude is estimated on the basis of student's oral answer on the questions in the ticket. The ticket includes two theoretical questions, and optionally an excersise on programming or circuit fragment calculation.