National Technical University of Ukraine
"Igor Sikorsky Kyiv Polytechnic Institute"

Department
biomedical engineering

Medical microprocessor systems

Working program of basic discipline (Silabus)

Requisites for basic discipline	
Level of higher education	***Second (master's)***
Branch of knowledge	*16 Chemical and Bioengineering*
Specialty	*163 Biomedical Engineering*
Educational program	*Medical Engineering*
Discipline status	*Mandatory discipline*
Form of study	*full-time / day / mixed / remote*
Year of preparation, semester	*1 course (autumn semester, spring semester)*
The scope of discipline	*9 ECTS credits / 270 hours*
Semester control / Control measures	*Test Work, Modular Test Work, Calculation and Graphic Work*
Lessons schedule	*According to the schedule on the site http://rozklad.kpi.ua/*
Language of instruction	*English*
Information about course leader / teachers	***Lecturer:*** *Doctor of Technical Sciences, Associate Professor, Head Department of BME Shlykov Vladyslav Valentynovych, e-mail: v.shlykov@kpi.ua, Telegram: https://t.me/vshlykov* ***Practical:*** *Doctor of Technical Sciences, Associate Professor, Head Department of BME Shlykov Vladyslav Valentynovych, e-mail: v.shlykov@kpi.ua, Zoom: 716 114 6823, code 2021*
Course placement	*Platform «Sikorsky» - course «Medical Microprocessor Systems» (az72wi)*

Distribution of hours

Semester	Lectures	Practical	Laboratory	Independent Work
autumn semester	*18*	*36*	*18*	*63*
spring semester	*18*	*36*	*18*	*63*

Curriculum of the discipline

1. Description of the discipline, its purpose, subject of study and learning outcomes

The main purpose of the discipline "Medical microprocessor systems" is to form students' ability to solve complex specialized problems and practical problems of architecture of single-chip and digital signal microprocessor systems, which involves the use of theories and scientific methods of analog and digital electronics, software and hardware design of medical devices and systems.

The discipline "Medical microprocessor systems" studies the application of methods of analog and digital electronics, architecture of single-chip and digital signal microprocessor systems, software and hardware for designing medical devices and systems for solving problems related to the development and engineering of biological and medical devices and systems that include digital signal microprocessors for medical purposes.

Skills are required to study the discipline:

1. *Microprocessor programming tools of family Texas Instruments TMS320;*
2. *Tools for software development in the environment Code Composer Studio;*
3. *Software Texas Instruments DSK6400;*

General competencies *(OPP was put into effect by the Rector's Order NON/ 89/2021 of 19.04.2021):*

GC 1 *- Ability to abstract thinking, analysis and synthesis.*
GC 2 *- Ability to search, process and analyze information from various sources.*
GC 3 *- Ability to identify, formulate and solve problems.*
GC 5 *- Ability to work in an international context.*

Special (professional) competencies *(OPP was put into effect by the Rector's Order NON/ 89/2021 of 19.04.2021):*

PC 1 *- Ability to solve complex problems of biomedical engineering using the methods of mathematics, natural and engineering sciences.*
PC 2 *- Ability to develop a working hypothesis, plan and set experiments to test the hypothesis and achieve the engineering goal using appropriate technologies, technical means and tools.*
PC 9 *- Ability to create tools and methodologies of scientific activity, evaluation and implementation of the results of modern developments, solutions and achievements of engineering and exact sciences in medicine and biology.*
PC 10 *- Ability to design and practical use of microcomputer and microprocessor systems in medical and diagnostic information and measuring equipment.*

The program learning outcomes after studying the discipline "Medical Microprocessor Systems" are *(OPP was put into effect by the Rector's Order NON/ 89/2021 of 19.04.2021):*

PLO 1 *- Understanding of fundamental-applied, medical-physical and bioengineering bases of technologies and equipment for research of physiological and pathological processes of the person.*
PLO 2 *- Understanding the principles of action of modern diagnostic equipment and display systems of biomedical information, the basis of appropriate software.*
PLO 3 *- Possession of modern methods of scientific research software, construction of adequate theoretical models and methods of their substantiation.*
PLO 4 *- Application of calculation methods and selection of classical and new designs of biomaterials, elements of devices and systems of medical appointment.*
PLO 5 *- Application of methods and tools for designing computer networks.*
PLO 6 *- Possession of methods of designing digital microprocessor and biotechnical systems for medical purposes.*
PLO 8 *- Knowledge of general requirements for the conditions of engineering, technological and scientific projects.*
PLO 13 *- Knowledge of a foreign language to an extent sufficient for general and professional communication.*
PLO 16 *- Knowledge of methods of design, construction, improvement and application of medical-technical and bioengineering products, devices and systems in compliance with technical requirements, as well as to support their operation.*
PLO 17 *- Analysis and solution of complex medical-engineering and bioengineering problems with the use of mathematical methods and information technologies.*

2. Prerequisites and postrequisites of the discipline (place in the structural and logical scheme of education according to the relevant educational program)

The discipline "Medical microprocessor systems" belongs to the cycle of professional training and has an interdisciplinary nature. It integrates knowledge from other disciplines according to its subject: analog and digital circuitry, object-oriented programming, etc. For the structural and logical scheme of preparation of master's degree programs it is necessary to pay attention to other

disciplines of general and professional training: "Biomedical information display systems", "Diagnostic and therapeutic methods in arrhythmology and electrophysiology".

The obtained practical navigation and mastered theoretical knowledge during the study of the discipline "Medical microprocessor systems" can be used in the future during the involvement of educational elective disciplines: "Physiotherapeutic medical devices", "Electronic sensors and biology".

3. The content of the discipline

The main sections and topics that will be considered in the process of studying the course:

Section 1. Interfaces and means of conjugation of digital signal processors (DSP)

Subject 1.1. Interfaces of digital signal processors.

Subject 1.2. Means of conjugation of digital signal processors.

Section 2. DSP software and control systems

Subject 2.1. Integrated code development environment for the DSP family of processors TMS320.

Subject 2.2. Data exchange between the PC and the debugging system in real time.

Section 3. Centralized and distributed control in systems based on DSP

Subject 3.1. Centralized control in DSP-based systems.

Subject 3.2. Distributed control in DSP-based systems.

Section 4. Architectural features of DSP

Subject 4.1. Architectural features of modern microprocessors.

Subject 4.2. DSP processor architecture of family TMS320.

Section 5. Processor instruction system TMS320C64xx

Subject 5.1. Processor instruction system TMS320C64xx.

Subject 5.2. Optimization of program code in the language C/C++ .

Section 6. Methods of creating a microprocessor system based on DSP TMS320C6455.

Subject 6.1. Methods of creating a microprocessor system based on DSP.

Subject 6.2. Digital signal processing based on DSP TMS320C6455.

Section 7. Software and hardware input / output.

Subject 7.1. Software and hardware input / output.

Subject 7.2. Real-time data exchange (RTDX).

Section 8. Signal and communication controllers.

Subject 8.1. Signal controllers.

Subject 8.2. Communication controllers.

Section 9. Means of designing microprocessor systems.

Subject 9.1. Development of the structural scheme and algorithm of functioning.

Subject 9.2. Selection of types of sensors and actuators.

Subject 9.3. Software development.

4. Training materials and resources

Basic literature:

1. *Солонина А. І., Улаховіч Д. А., Яковлев Л. А. Алгоритми і процесори цифрової обробки сигналів - СПб: БХВ-Петербург, 2001. - 464 с.*
2. *Code Composer Studio Development Tools v3.3: SPRU509H. Texas Instruments Incorporated, 2006 – 102 p.*
3. *TMS320C64x Technical Overview: PRU395B. Texas Instruments Incorporated, 2001 – 57 p.*

4. *TMS320C6000 Programmer's Guide: SPRU198K Revised. Texas Instruments Incorporated, 2011 – 441 p.*
5. *Medical Applications Guide. Texas Instruments, 2001 – 153 p.*
6. *Шликов, В. В. Медичні мікропроцесорні системи. Практикум [Електронний ресурс] : навчальний посібник для студентів спеціальності 163 «Біомедична інженерія» та 152 «Метрологія та інформаційно-вимірювальна техніка» / В. В. Шликов ; КПІ ім. Ігоря Сікорського. – Київ : КПІ ім. Ігоря Сікорського, 2018. – 112 с.*
7. *Shlykov, V. V. Medical microprocessor systems [Electronic resource] : Workshop on discipline for students of specialties 163 «Biomedical Engineering» and 152 «Metrology and information-measuring technique» / V. V. Shlykov, V. A. Danilova ; Igor Sikorsky Kyiv Polytechnic Institute. – Kyiv, Igor Sikorsky Kyiv Polytechnic Institute, 2020. – 109 p.*

Additional literature:

1. *Тартаковский, Д.Ф. Метрология, стандартизация и технические средства измерений / Д.Ф. Тартаковский, А.С. Ястребов. – М. : Высшая школа, 2002. – 206 с.*
2. *Пухальский, Г.И. Проектирование микропроцессорных устройств : учебное пособие для вузов / Г.И. Пухальский. – СПб.: Политехника, 2001. – 588 с.*
3. *Фомичев, А.В. Цифровые интегральные микросхемы. Справочное пособие по информационно-технологическому обеспечению проектирования радиоэлектронных систем / А.В. Фомичев, В.М. Строев, А.Н. Ветров. – М. : Машиностроение, 1999. – 123 с.*
4. *Рябенький В.М., Жуйков В.Я., Гулий В.Д. Цифрова схемотехніка: Навч. посібник. - Львів: «Новий Світ-2000», 2009.-736 с.*
5. *Технология производства радиоэлектронной аппаратуры /С.В. Фролов и др. – Тамбов: Изд-во ГОУ ВПО ТГТУ, 2010. – 96 с.*
6. *Лебедєв О.М., Ладик О.І. Цифрова техніка. – К.: ІВЦ «Видавництво «Політехніка», 2004.*

Educational content

5. Methods of mastering the discipline (educational component)

№ s/n	Subject	Program learning outcomes	The main tasks	
			Control measure	Deadline
Autumn semester, 4.5 ECTS credits / 135 hours				
1.	*Interfaces of digital signal processors.*	*PLO 2* *PLO 5*	*Practical work 1, 2* *Laboratory work 1*	*3rd week*
2.	*Means of conjugation of digital signal processors.*	*PLO 2* *PLO 5*	*Practical work 3, 4* *Laboratory work 2*	*4th week*
3.	*Integrated code development environment for the DSP family of processors TMS320.*	*PLO 6* *PLO 8*	*Practical work 5, 6* *Laboratory work 3*	*5th week*
4.	*Data exchange between the PC and the debugging system in real time.*	*PLO 6* *PLO 16*	*Practical work 7, 8* *Laboratory work 4*	*6th week*
5.	*Centralized control in DSP-based systems.*	*PLO 3* *PLO 6* *PLO 16*	*Practical work 9, 10* *Laboratory work 5*	*8th week*
6.	*Distributed control in DSP-based systems.*	*PLO 3* *PLO 6* *PLO 16*	*Practical work 11, 12* *Laboratory work 6*	*9th week*
7.	*Architectural features of modern microprocessors.*	*PLO 6* *PLO 8* *PLO 17*	*Practical work 13, 14* *Laboratory work 7*	*10th week*

8.	DSP processor architecture of family TMS320.	PLO 6 PLO 8	Practical work 15, 16 Laboratory work 8	11th week
9.	Calculation and graphic work	PLO 1 PLO 4 PLO 6 PLO 13	Registration and submission of work	13-14th week
10.	Modular control work		Practical work 17	13th week
11.	Test		Practical work 18 Laboratory work 9	14th week
Spring semester, 4.5 ECTS credits / 135 hours				
11.	Processor instruction system TMS320C64xx.	PLO 6 PLO 8 PLO 13	Practical work 1, 2 Laboratory work 1	3rd week
12.	Optimization of program code in the language C/C++.	PLO 6 PLO 8 PLO 13	Practical work 3, 4 Laboratory work 2	4th week
13.	Methods of creating a microprocessor system based on DSP.	PLO 5 PLO 6 PLO 8 PLO 17	Practical work 5, 6 Laboratory work 3	5th week
14.	Digital signal processing based on DSP TMS320C6455.	PLO 1 PLO 4 PLO 6 PLO 8	Practical work 7, 8 Laboratory work 4	6th week
15.	Software and hardware input / output.	PLO 5 PLO 6 PLO 8	Practical work 9, 10 Laboratory work 5	8th week
16.	Real-time data exchange (RTDX).	PLO 5 PLO 6 PLO 8	Practical work 11, 12 Laboratory work 6	9th week
17.	Signal controllers.	PLO 5 PLO 6 PLO 8	Practical work 13 Laboratory work 7	10th week
18.	Communication controllers.	PLO 5 PLO 6 PLO 8	Practical work 14 Laboratory work 8	11th week
19.	Development of the structural scheme and algorithm of functioning.	PLO 6 PLO 8 PLO 16	Practical work 15	12th week
20.	Selection of types of sensors and actuators.	PLO 2 PLO 6 PLO 8	Practical work 16	
21.	Software development.	PLO 3 PLO 6 PLO 8	Laboratory work 9	
22.	Calculation and graphic work	PLO 1 PLO 4 PLO 6 PLO 13	Registration and submission of work	13-14th week
23.	Modular control work		Practical work 17	13th week
24.	Test		Practical work 18	14th week

6. Independent student work

One of the main types of semester control during the mastering of the discipline "Medical microprocessor systems" is the implementation of calculation and graphic work. Calculation and graphic work is performed in accordance with the requirements, within the period specified by the teacher.

The main purpose of computational and graphic work is to solve a practical problem using the material learned in lectures and independently, and practical skills acquired in practical work. The student can write calculation and graphic work only on the subject agreed with the teacher.

Approximate subject of calculation and graphic work:

1. *Design of a blood gas analyzer on the base DSP TMS320C64xx;*
2. *Design of blood pressure monitor on the base DSP TMS320C64xx;*
3. *Designing a computer tomograph on the base DSP TMS320C64xx;*
4. *Design of a chemical gas analyzer on the base DSP TMS320C64xx;*
5. *Design of an electrocardiograph on the base DSP TMS320C64xx;*
6. *Designing an endoscope on the base DSP TMS320C64xx;*
7. *Design of a digital temperature sensor on the base DSP TMS320C64xx;*
8. *Design of an isolated thermocouple on the base DSP TMS320C64xx;*
9. *Design of magnetic resonance imaging (MRI) on the base DSP TMS320C64xx;*
10. *Design of digital medical glucometer on the base DSP TMS320C64xx;*
11. *Design of a video-monitoring system for patients on the base DSP TMS320C64xx;*
12. *Design of a digital pulse oximeter on the base DSP TMS320C64xx;*
13. *Design of a digital stethoscope on the base DSP TMS320C64xx;*
14. *Design of a medical X-Ray analyzer on the base DSP TMS320C64xx.*

The title page of the calculation and graphic work should have the following content: the name of the university; name of the faculty; name of department; name of specialty, name of educational-professional program, name of academic discipline; theme of calculation and graphic work; surname and name of the student, course, number of the academic group, year.

The title page is followed by a detailed plan (content) of the calculation and graphic work, which should highlight the introduction, sections of the main content (main topics studied), their subdivisions (if necessary), conclusion, list of sources used. The table of contents on the right indicates the page numbers at the beginning of each question. Each section begins on a new page.

The total amount of calculation and graphic work, depending on the chosen topic can vary from 25 to 40 pages of the main text (in consultation with the teacher). The amount of computational and graphic work is determined by the student's ability to briefly and at the same time comprehensively explain and analyze the program code in the Code Composer Studio environment.

Mandatory requirement: clear reference to sources of information. All figures, facts, opinions of scientists, quotations, formulas should have a reference in the form [2, p. 54] (the first digit means the number of the source in the list of references given at the end of the creative work, and the second digit - the page number in this source). It is desirable to use tables, diagrams, graphs, charts, etc. The list of used sources (not less than 10 sources) is made out according to operating rules. If the information is taken from the Internet, you need, as for ordinary literature, specify the author, the title of the article, and then provide the address of the site on the Internet.

Calculation and graphic work is evaluated by the following criteria: logic of the plan; completeness and depth of topic disclosure; reliability of the received data; reflection of practical materials and results of calculations; correctness of formulation of conclusions of the received results and conclusions; design; substantiation of the student's own opinion on this issue in the form of a conclusion.

Deadline for submission of calculation and graphic work for verification: 13-14th week of study.

Calculation and graphic work is not tested for plagiarism, but must meet the requirements of academic integrity. In case of academic dishonesty, the work is canceled and not checked.

Policy and control

7. Policy of academic discipline (educational component)

Attending classes

Attendance at lectures is optional. Attending practical classes is desirable, as they are used to write express tests / tests, as well as to defend practical work.

The grading system is focused on obtaining points for student activity, as well as performing tasks that are able to develop practical skills and abilities.

Control measures missed

Missed control measures (defense of practical work) must be practiced in the next classes, provided that the task is scheduled for the current lesson, or in consultations.

Omissions of writing a module test and express test are not fulfilled.

Calculation and graphic work, which is submitted for inspection in violation of the deadline is evaluated with a decrease in the number of weight points.

Violation of deadlines and incentive points

Encouragement points		Penalty points *	
Criterion	Weight points	Criterion	Weight points
Improving practical work	1 points (for each practical work)	Untimely implementation and test of practical work	From -0.5 points to -5 points (depending on the delivery date)
Passing distance courses on topics that are agreed with teachers	5 points	Untimely execution and test of calculation and graphic work	From -2 points to -20 points (depending on the construction period)
Registration of scientific work for participation in the competition of student scientific works	10 points		
Writing abstracts, articles, participation in international, national and / or other events or competitions on the subject of the discipline	5 points		

** if the control measure was missed for a good reason (illness, which is confirmed by a certificate of the established sample) - penalty points are not accrued.*

Academic integrity

The policy and principles of academic integrity are defined in Section 3 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Read more: https://kpi.ua/code.

Norms of ethical behavior

Normative principles of behavior of students and employees, defined in sections 2 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Read more: https://kpi.ua/code.

Procedure for appealing the results of control measures

Students have the opportunity to raise any issue related to the control procedure and expect it to be addressed according to predefined procedures.

The student has the right to appeal the results of the control measure according to the approved provision on appeals in the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (approved by the order №NON/128/2021 from 20.05.2021) - https://osvita.kpi.ua/index.php/node/182

Inclusive education

The discipline "Medical Microprocessor Systems" can be taught to most students with special educational needs, except for students with severe visual impairments who do not allow to perform tasks using personal computers, laptops and / or other technical means.

Distance learning

Distance learning takes place through the Sikorsky Distance learning Platform «Sikorsky».

Distance learning through additional online courses on certain topics is allowed subject to agreement with students. If a small number of students wish to take an online course on a specific topic, studying the material with such courses is allowed, but students must complete all the tasks provided in the discipline.

The list of courses is offered by the teacher after the students have expressed a desire (because the bank of available courses is updated almost every month).

The student provides a document confirming the completion of the distance course (in the case of a full course) or provides practical tasks from the distance course and subject to an oral interview with the teacher on the topics can receive grades for control measures provided for the studied topics (express control / test tasks, practical work).

Performance of practical works, and also performance of settlement and graphic work, is carried out during independent work of students in a remote mode (with a possibility of consultation with the teacher through e-mail, social networks).

Learning a foreign language

Teaching in English is carried out only for foreign students.

At the request of students, it is allowed to study the material with the help of English-language online courses on topics that correspond to the topics of specific classes.

8. Monitor and evaluate the system of evaluation of learning outcomes (Rating System of Evaluation)

Evaluation system (current control):

1. *Autumn semester, 4.5 ECTS credits / 135 hours*

№ s/n	Control measure	%	Weight points	Number	Total
1.	Express control works / test tasks	14	2	7	14
2.	Execution and test of practical works	32	2	16	32
3.	Execution and test of laboratory works	27	3	9	27

4.	Modular control work (MCW)	12	12	1	12
5.	Calculation and graphic work (CGW)	15	15	1	15
6.	Test work[1]	80	80	1	80
	Total				100

2. Spring semester, 4.5 ECTS credits / 135 hours

№ s/n	Control measure	%	Weight points	Number	Total
1.	Express control works / test tasks	14	2	7	14
2.	Execution and test of practical works	32	2	16	32
3.	Execution and test of laboratory works	27	3	9	27
4.	Modular control work (MCW)	12	12	1	12
5.	Calculation and graphic work (CGW)	15	15	1	15
6.	Test work[2]	80	80	1	80
	Total				100

The applicant receives a positive credit score for the results of the semester, if he has a final rating for the semester of at least 60 points and has met the conditions of admission to the semester control, which are determined by the RSE (Rating System of Evaluation).

With applicants who have met all the conditions of admission to the test and have a rating of less than 60 points, as well as with those applicants who want to increase their rating, in the last scheduled lesson in the semester, the teacher conducts semester control in the form of test or interviews.

After performing the test, if the score for the test is higher than the rating, the applicant receives a score based on the results of the test.

If the grade for the test is lower than the rating, a "hard" RSE is used - the previous rating of the applicant (except for points for the semester individual task) is canceled and he receives a grade based on the results of the test. This option forms a responsible attitude of the applicant to the decision to perform the test, forces him to critically assess the level of his training and carefully prepare for the test.

***Calendar control** (CC) - is performed twice a semester as monitoring of the current state of compliance with syllabus requirements.*

The purpose of calendar control is to improve the quality of student learning and monitor the implementation of the schedule of the educational process by students.

Criterion			The first CC	The second CC
Deadline of calendar controls			8th week	14th week
Conditions for obtaining a positive result from the calendar control	Current rating		≥ 24 points	≥ 40 points
	Execution practical work	PW № 1- 8	+	+
		PW № 9-16	-	+
	Execution of laboratory works	LW № 1- 4	+	+
		LW № 5- 9	-	+
	Express control works / test tasks	At least 4 of any lectures	+	-
		At least 8 of any lectures	-	+
	Modular control work	Estimated MCW	-	+
	Calculation and graphic work	Estimated CGW	-	-

[1] *Taken into account in the amount of the rating together with the grade for CGW in case the student has not scored 60 points per semester or he wants to improve his grade.*

[2] *Taken into account in the amount of the rating together with the grade for CGW in case the student has not scored 60 points per semester or he wants to improve his grade.*

In case of detection of academic poor quality during training - the control measure is not credited.

Semester certification of students

	Mandatory condition for admission to the test	*Criterion*
1	*Current rating*	*RD ≥ 42*
2	*Obtaining a positive assessment for the performed calculation and graphic work*	*More than 8 points*
3	*All practical works are tested*	*More than 14 points*
3	*All laboratory works are tested*	*More than 14 points*
4	*Writing at least 6 express tests / tests*	*More than 6 points*

The results are announced to each student separately in the presence or remotely (by e-mail). Also recorded in the system "Electronic Campus".

Optional conditions for admission to closure:

1. *Activity in practical classes.*
2. *Activity in laboratory classes.*
3. *Positive result of the first attestation and the second attestation.*
4. *Attending 50% of lectures.*

Table of translation of rating points to grades on a university scale:

Number points	*Assessment on the university scale*
100-95	*Perfectly / Відмінно*
94-85	*Very good / Дуже добре*
84-75	*Good / Добре*
74-65	*Satisfactorily / Задовільно*
64-60	*Enough / Достатньо*
Less 60	*Unsatisfactorily / Незадовільно*
Admission conditions are not met	*Not allowed / Не допущено*

9. Additional information on the discipline (educational component)

The list of questions for preparation for modular control work, and also for preparation for credit is given in appendix 1.

Distance learning through additional online courses on certain topics is allowed subject to agreement with students. If a small number of students wish to take an online course on a specific topic, studying the material with such courses is allowed, but students must complete all the tasks provided in the discipline.

The list of courses is offered by the teacher after the students have expressed a desire (because the bank of available courses is updated almost every month).

The student provides a document confirming the completion of the distance course (in the case of a full course) or provides practical tasks from the distance course and subject to an oral interview with the teacher on the topics can receive grades for control measures provided for the studied topics (express control / test tasks, practical work).

Work program of the discipline (syllabus):

Compiled by *Associate Professor of Biomedical Engineering, Doctor of Technical Sciences, Shlykov Vladyslav Valentynovych, Head of the Department of Biomedical Engineering.*

Approved by *the Department of Biomedical Engineering (protocol № ___ to _____)*

Approved by *the Methodical Commission of the Faculty of Biomedical Engineering (protocol № __ to _____)*

Appendix 1 to the syllabus of the discipline

"Medical microprocessor systems"

The list of questions for preparation for modular control work,

And also for preparation for test

1. *Interfaces of digital signal processors.*
2. *Means of interference of digital signal processors.*
3. *Data exchange between PC and debug real-time system.*
4. *Features of centralized management in systems based on DSP.*
5. *Features of common control in systems based on DSP.*
6. *DSP architecture of TMS320 family processors.*
7. *TMS320C64xx processor instruction system.*
8. *Methods of creating a microprocessor system based on DSP.*
9. *Software and hardware input / output.*
10. *Selection of types of sensors and actuators.*
11. *TMS320C6000 board features.*
12. *Serial interfaces of the TMS320C6000 board.*
13. *SPI interface of the TMS320C6000 board:*
14. *Communication of the digital signal processor TMS320C6000 with the USB port of the computer.*
15. *Criteria for selecting Memory Chips.*
16. *Basic techniques of integrated control of a microprocessor system.*
17. *Does the informativeness of the registered signals depend on your main factors?*
18. *The main purpose of the contact system of the medical sensor.*
19. *What is understood during data transfer?*
20. *What information conversion operations require the introduction of similar information in the microprocessor system?*
21. *Which editor supports the TMS320C6000 board interface?*
22. *Which Texas Instruments library to support RTDX technology should be installed on LabVIEW 2010?*
23. *What software features in C/C++ in Code Composer Studio are designed to configure RTDX channels?*
24. *What software functions in C/C++ in Code Composer Studio are designed to input / output data via RTDX channels?*
25. *What components of Texas Instruments for NI LabVIEW 2010 are intended for input / output of data in the investigated port?*
26. *What functions of the RTDX Texas Instruments library for NI LabVIEW 2010 are intended for project management in Code Composer Studio?*
27. *What are the classic methods of optimizing the use of C/C++ compilers from TI in Code Composer Studio?*
28. *What microprocessor systems support the DSP / BIOS operating system in the Code Composer Studio environment?*
29. *What steps do I need to take to adjust the settings of the emulator to the microprocessor board?*
30. *Which C/C++ libraries need to be connected to use special functions that contain data for TMS320C6455 processors?*
31. *Assignment of signal controllers.*
32. *Appointment of communication controllers.*
33. *Digital signal processing based on DSP.*