

---

Faculty of Information Technology  
Department of Information Systems

Approved  
Vice-Rector of Academic and Educational  
Affairs of IITU JSC  
\_\_\_\_\_ Umarov T.F.  
«\_\_» \_\_\_\_\_ 20\_\_

## SYLLABUS (ACADEMIC PROGRAM)

**Course:** GTE 4111 GREEN TECHNOLOGIES AND ECONOMY  
(code, title)

**Major:** 5B070300 Information Systems  
(code, title)

**Educational program** 6B06105 «Information System»  
(code, title)

**Year:** 4, **Semester:** 7; **Number of credits:** 5

**Lectures:** 15 hours

**Laboratory classes:** 15 hours

**Practical classes:** 15 hours

**T/SIS:** 105 hours

**Total:** 150 hours

**Final assessment form:** Project

Almaty 2020

Academic Program of the course «Green technologies and economy »  
(course name)

has been developed on the basis of a Standard Academic program.

Academic program has been reviewed at the meeting of «Information system»  
Department name

Minutes № 1 dated «17» 08 2020 .

Head of department \_\_\_\_\_ A.B. Kassymova, assoc. professor,  
PhD  
signature full name, title, degree

Author \_\_\_\_\_ R.Zh. Satybaldiyeva, assoc. professor, Cand. Sc. (Technology)  
signature full name, title, degree

The educational-methodological complex of discipline was approved at the meeting of the Academic Council of JSC "International information technologies university" Minutes № 1 dated " 28" 08 2020 .

Director of the Department \_\_\_\_\_ A.Mustafina  
*Signature*  
for Academic Affairs

<b>1. General information</b>	
Faculty	Information Technology
Major code and title	5B070300 Information Systems
Year, semester	4 year, 7
Subject category	General education, basic, major
Number of Credits	3
Language of Delivery:	English
Prerequisites:	BDIS 2302 Database in information systems, SDP03 Application Design Choices
Postrequisites	
Lecturer	Ryskhan Zhakanovna Satybaldiyeva assistant professor, candidate of technical science Office 802, ph. +7 727 3308563 ext 2050 e-mail: <a href="mailto:r.satybaldiyeva@iitu.kz">r.satybaldiyeva@iitu.kz</a> consultation schedule: 10.00-14.00 Wednesday
Instructors	Auyezova Anel Sattarkyzy, senior lecturer, office 802, <a href="mailto:anel.auezova@gmail.com">anel.auezova@gmail.com</a> , <a href="mailto:a.auezova@iitu.kz">a.auezova@iitu.kz</a> , 15:00-17:00 Tuesday, 15:00:-17:00 Friday Karimzhan Nurlan Berlibekuly, senior lecturer, MSIT in eBiz Technology, office 107, <a href="mailto:nkarimzhan@gmail.com">nkarimzhan@gmail.com</a> , office days: Tue 12:00-13:00 and Thu 12:00-13:00 Beisembiyev Bakhytzhann Usenovich, senior lecturer, MSc of Science, office 802, <a href="mailto:baha.applecity@gmail.com">baha.applecity@gmail.com</a> , <a href="mailto:b.beisembiyev@iitu.kz">b.beisembiyev@iitu.kz</a> , 10.00-12.00 Saturday, 10.00-12.00 Friday
<b>2. Goals, objectives and learning outcomes of the course</b>	
<p>This course is about green technology and its effect on the modern world. It covers a wide variety of subjects such as resource management, energy harvest and storage, cleaning of drinking water etc. The solutions will be discussed in relations to their value for the society, technological limitations and potential ethical issues. The course also introduces concepts and terms within innovation, and these are related to processes and methods in research and development. The course puts focus on the capability of the student to communicate professional ideas (both orally, visually and in writing) and to critically assess own solutions. Finally, the course will familiarize students with state programs, standards in the field of sustainable development, international conventions on climate change.</p>	
<p>Course objectives</p> <p>Give knowledge and understanding of future technological and societal challenges where ICT can be put to use as well as an understanding of potential technology solutions.</p> <p>Give the competence to put innovation into a technical context as well as illustrate coherences between innovation and society.</p> <p>Provide an understanding of the processes and methods within innovation, research and development within the industry and the relation to academic research.</p> <p>Give skills within innovation and applied use of the professional competences within obtained during the study</p> <p>Give competencies for assessing the value and potential problems related to specific technological solutions within ICT</p> <p>Provide skills in oral, visual and written communication of green ICT concepts.</p>	
<p>Learning Outcomes:</p> <p>The learning objective of the course is that the student demonstrates the ability to:</p> <p>Account for societal and technological challenges based on specific cases as well as the fundamental principles behind potential solutions</p>	

Account for the importance of innovation in relation to the solution of technological challenges  
 Describe the general concepts in innovation and development processes and their relevance for scientific innovation  
 Assess the societal- and business-related potential as well as drawbacks of a technological solutions.  
 Illustrate possibilities for applied use of theoretical knowledge

**3. Course description**

Green technology is also used as sustainable or environmental technology. It takes into account the long and short-term impact of something on the environment. Green technologies are environmentally friendly by definition. It includes energy efficiency, recycling, health and safety concerns, renewable resources and more.

**4. Course policy**

**Students are forbidden to:**

- submit any tasks after the deadline. The mark for late submissions is decreased;
- cheat. Plagiarized papers shall not be graded and receive a "0";
- be late for classes;
- retake any tests, unless there is a valid reason for missing them;
- use mobile phones in class;

**Students should always**

- be appropriately dressed (formal/semi- formal styles are acceptable);
- show consideration for and mutual support of teachers and other students;
- let the teacher know of any problems arising in connection with their studies.

During classes students can use online platforms like MS Teams, DL, Zoom, etc.

**5. Literature**

**Basic literature:**

Ускенбаева Р.К., Куандыков А.А., Бектемысова Г.У., Молдагулова А.Н., Сатыбалдиева Р.Ж. «Зеленые» технологии в информационно-коммуникационных технологиях» для студентов ИКТ специальности Высших учебных заведений – Алматы: Қазақ университеті, 2020. – 448 с.

Hesketh, Robert P. "Introduction to Sustainable and Green Engineering: General Principles and Targets." Encyclopedia of Sustainable Technologies. Ed. Abraham, Martin A. Oxford: Elsevier, 2017. 497-507. Print.

Oncel, Suphi S. "Green Energy Engineering: Opening a Green Way for the Future." Journal of Cleaner Production 142 (2017): 3095-100. Print.

**Supplementary literature:**

Tonn, B., and P. Carpenter. "Technology for Sustainability." Encyclopedia of Ecology. Eds. Jørgensen, Sven Erik, and Brian D.

**3. Online Resources & References**

Video course of video lectures or reference to it and practical classes in dl

<https://dl.iitu.kz/course/view.php?id=11719>,

MS Teams,

<https://earth911.com/recycling/computers/>

**6. Course schedule**

Week/ date	Course topics	References	Lectures (h/w)	Practical sessions (h/w)	Lab. sessions (h/w)	TSIS (h/w)	SIS (h/w)

1	INTRODUCTION Using ICTs for Sustainable and Inclusive Socio-Economic Development. The relevance of green technologies. The key role of ICT as a system for environmentally sound economic development. Main priorities and directions for the use of "green" ICTs. Green Growth Concept.	[1] Ch. 1: p. 14-57	1	1	1	2	5
2	Basic concepts "Green office", "Green" standards, "Green" economy Green Office Policy Green ICT standards Green Economy of Kazakhstan Foreign experience in the development and improvement of information and communication technologies and their role in the formation of a green economy	[1] Ch. 2: 66-122	1	1	1	2	5
3	Priority Areas for Green Growth Driven by ICT Intelligent grids Smart buildings, green buildings (green building); standards and rating systems for smart buildings; differences (and similarities) between smart buildings and green buildings	[1] Ch. 3: 124-155	1	1	1	2	5
4	Environmental protection Overview of the impact of ICTs on the entire environment. ICTs facilitate environmental observation. The potential of ICTs to tackle the effects of climate change Supporting research and development on the use of ICTs to support green growth and development.	[1]Ch.4 , 159-190	1	1	1	2	5
5	Environmental Monitoring Use of existing and planned ICT infrastructure Using Wireless Sensor Networks (WSN)	[1]Ch.5 , 6. 201-212	1	1	1	2	5

6	Climate Improvement Adoption of policies and regulatory incentives based on international standards Applications and their implications for climate change and sustainable development	[1] Ch.7,21 8-246	1	1	1	2	5
7	Raising awareness and opportunities for experience in adaptation ICT Potential for Addressing Environmental Challenges Including Climate Change and E-Waste Research and development on the use of ICTs to promote environmental sustainability Ways to Use ICTs for Climate Change Mitigation	[1] Ch.8 p.253-259	1	1	1	2	5
8	<b>Review materials Chapters 1-10 and 15-16 for Mid-Semester Exam</b>	[1]	1	1	1	2	5
9	Management of e-waste Life Cycle in ICT Development (Eco-design) to Reduce E-Waste Disposal of components and materials recovered from used mobile phones.	[1] Ch.9, p.261-291	1	1	1	2	5
10	Partnerships for Environmental Sustainability. Developing green ICTs to support a green economy	[1] Ch.10 p.294-317	1	1	1	2	5
11	Data Center Energy Efficiency Strategies, Design and Optimization. Strategy Development, Design and Power Optimization.	[1] Ch.11 p.447-478	1	1	1	2	5
12	Benefits of using ICTs in energy generation and management. Favors for the development of smart grids (smart grids)	[1] Ch.12, 351-363	1	1	1	2	5

13	Technologies, Applications and Principles of Smart Buildings Overview of methods, standards and systems that support smart buildings. Differences (and similarities) between smart buildings and green buildings. Improving Green Buildings with Smart Technologies.	Ch 13 p.368-381	1	1	1	2	5
14	ICT in the field of logistics, production and transport systems	Ch 14 p.384-394	1	1	1	2	5
15	<b>Review materials</b>	Chapter s 1-16	1	1	1	2	5
<b>Total hours</b>		<b>150</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>30</b>	<b>75</b>

**6. List of topics/ assignments for laboratory classes**

<b>№</b>	<b>Topic Title</b>	<b>Number of hours</b>	<b>References</b>	<b>Form of reporting</b>	<b>Deadline</b>
1	2	3	4	5	6
1	Using ICTs for Sustainable and Inclusive Socio-Economic Development	2	[1],[2],[3],[4],[	Exercise	2 week
2	Green Office Policy Green ICT standards	4	[1],[2],[3],[4],[	Report	End of the 3-rd week
3	The smart city concept	2	[1],[2],[3],[4],[	Exercise	End of the 4-th week
4	Environmental protection	2	[1],[2],[3],[4],[	Project	End of the 5-th week
5	Environmental Monitoring	2	[1],[2],[3],[4],[	Exercise	End of the 6-th week
6	Adapting and Preparing for Natural Disasters	2	[1],[2],[3],[4],[	Report	End of the 7-th week
7	Climate Improvement	2	[1],[2],[3],[4],[	Exercise	End of the 8-th week
8	Raising awareness and opportunities for experience in adaptation ... Ways to Use ICTs for Climate Change Mitigation	2	[1],[2],[3],[4],[	Project	End of the 9-th week
9	Management of e-waste ICT carbon footprint	2	[1],[2],[3],[4],[	Exercise	End of the 10-th week
10	Partnerships for Environmental Sustainability ICT Applications for Climate Change Adaptation	2	[1],[2],[3],[4],[	Report	End of the 11-st week
11	Data Center Energy Efficiency Strategies, Design and Optimization.	2	[1],[2],[3],[4],[	Exercise	End of the 12-th week
12	Benefits of using ICTs in energy generation and management	2	[1],[2],[3],[4],[	Project	End of the 13-th week
13	Technologies, Applications and Principles of Smart Buildings	4	[1],[2],[3],[4],[	Case study	End of the 14-th week
		30			



## 6. List of topics/ assignments for practical classes

№	Topic Title	Number of hours	References	Form of reporting	Deadline
1	2	3	4	5	6
1	The driving force behind the transition to green growth Formation of an intellectual (intellectual) economy	1	[1],[2],[3],[4],[	Exercise	2 week
2	Energy Efficiency and Energy Saving: The Way of Progress Green ICT standards	1	[1],[2],[3],[4],[	Report	End of the 3-rd week
3	Differences (and Similarities) Between Smart Buildings and Green Buildings.	1	[1],[2],[3],[4],[	Exercise	End of the 4-th week
4	Cleantech and smarttech concepts	1	[1],[2],[3],[4],[	Project	End of the 5-th week
5	Adapting and Preparing for Natural Disasters	1	[1],[2],[3],[4],[	Exercise	End of the 6-th week
6	Implementation of standardized methodologies for assessing the impact on the entire ICT environment. Dematerialization	1	[1],[2],[3],[4],[	Report	End of the 7-th week
7	Dematerialization in the public and private sector (contribution to climate change mitigation) Dematerialization in the provision of public services	2	[1],[2],[3],[4],[	Exercise	End of the 8-th week
8	<b>Mid-Semester Exam</b>	1	[1],[2],[3],[4],[	Project	End of the 9-th week
9	Management of e-waste ICT carbon footprint	1	[1],[2],[3],[4],[	Exercise	End of the 10-th week
10	ICT Applications for Climate Change Adaptation	1	[1],[2],[3],[4],[	Report	End of the 11-st week
11	Developing a Strategic Plan for Software	1	[1],[2],[3],[4],[	Exercise	End of the 12-th week

12	Overview of Intelligent Grid Components	1	[1],[2],[3],[4],[	Project	End of the 13-th week
13	Trends, Projects and Case Studies for Smart Buildings	1	[1],[2],[3],[4],[	Case study	End of the 14-th week
14	ICT in the field of logistics, production and transport systems	1	[1],[2],[3],[4],[	Case study	End of the 15-th week
		15			

## 6. List of topics/assignments for Student Independent Study

Proper organization of students independent study is the key to the formation of skills in mastering, learning, assimilation and systematization of acquired knowledge, ensuring a high level of academic performance in the learning process

№	Topic/Assignment title	Number of hours	References	Form of reporting	Deadline
1	2	3	4	5	6
1	Green Growth Concept. The driving force behind the transition to green growth Formation of an intellectual (intellectual) economy	3	[1],[2],[3],[4],[5],[6],[7],[8],[9]	Discussion	End of the 1-st week
2	Energy Efficiency and Energy Saving: The Way of Progress	3	[1],[2],[3],[4],[5],[6],[7],[8]	Discussion	End of the 2-nd week
3	The smart city concept	3	[1],[2],[3],[4],[5],[6],[7],[8]	Discussion	End of the 3-rd week
4	Supporting research and development on the use of ICTs to support green growth and development. Cleantech and smarttech concepts	3	[1],[2],[3],[4],[5],[6],[7],[8]	Discussion	End of the 4-th week
5	Using Wireless Sensor Networks (WSN)	3	[1],[2],[3],[4],[5],[6],[7],[8]	Discussion	End of the 5-th week
6	Using Wireless Sensor Networks (WSN) for Disaster Detection	3	[1],[2],[3],[4],[5],[6],[7],[8]	Discussion	End of the 6-th week
7	Implementation of standardized methodologies for assessing the impact on the entire ICT environment	3	[1],[2],[3],[4],[5],[6],[7],[8]	Discussion	End of the 7-th week
8	Ways to Use ICTs for				

	Climate Change Mitigation				
9	Dematerialization in the provision of public services	3	[1],[2],[3],[4],[5],[6],[7],[8],[9]	Discussion	End of the 9-th week
10	Life Cycle in ICT Development (Eco-design) to Reduce E-Waste	3	[1],[2],[3],[4],[5],[6],[7],[8]	Discussion	End of the 10-th week
11	ICT Applications for Climate Change Adaptation	3	[1],[2],[3],[4],[5],[6],[7],[8]	Discussion	End of the 11-st week
12	Developing a Strategic Plan for Software	3	[1],[2],[3],[4],[5],[6],[7],[8]	Discussion	End of the 12-th week
13	Overview of Intelligent Grid Components	3	[1],[2],[3],[4],[5],[6],[7],[8],[10]	Discussion	End of the 13-th week
14	Improving Green Buildings with Smart Technologies	3	[1],[2],[3],[4],[5],[6],[7],[8],[10]	Discussion	End of the 14-th week

## 7. System for evaluating student performance in a discipline:

### Option 2

Each type of educational work is evaluated on a 100-point scale and is included in the average assessment of the current control, taking into account the weighting coefficient in accordance with the table

Period	Assignments	Maximum score	Weighting coefficient	Total
1 <sup>st</sup> attestation	Laboratory Practice	100	0,3	100
	Tests	100	0,3	
	SIS	100	0,1	
	MidTerm	100	0,2	
	Working during practical classes	100	0,1	
2 <sup>nd</sup> attestation	Laboratory Practice	100	0,3	100
	Tests	100	0,3	
	SIS	100	0,1	
	EndTerm	100	0,2	
	Working during practical classes	100	0,1	
Exam				100
Total	0,3*1stAtt+0,3*2ndAtt+0,4*Ex			100

\*If the number of absences exceeds 20%, student will be automatically scheduled for a Retake (summer semester)

**11. Assessment criteria:***Option 2*

The point-rating letter system for assessing the educational achievements of students with their interpretation in the traditional grading scale:

Letter Grade	Numerical equivalent	Points (%)	Traditional system assessment	General description of grading criteria
A	4,0	95-100	Excellent	The student has knowledge of the subject in the full scope of the curriculum, understands the discipline deeply enough; shows a high level of knowledge that exceeds the volume provided by the syllabus, gives an exhaustive answer
A-	3,67	90-94		The student has knowledge of the subject in the full scope of the curriculum, understands the discipline deeply enough; gives an exhaustive answer
B+	3,33	85-89	Good	The student shows a complete, well-founded knowledge of the subject, but the answers did not always highlight the main idea, rational methods of calculation were not always used; the answers were mostly brief and sometimes unclear.
B	3,0	80-84		
B-	2,67	75-79		
C+	2,33	70-74		
C	2,0	65-69	Satisfactory	The student demonstrates sufficient knowledge of the subject, but without proper depth and justification, the answers are unclear and without proper logical sequence.
C-	1,67	60-64		
D+	1,33	55-59		
D	1,0	50-54		
FX	0,5	25-49	Unsatisfactory	The student demonstrates insufficient knowledge of the subject, positive answers were not given to individual questions.
F	0	0-24		The student demonstrates a very low level of knowledge of the subject.

## 7. Assessment and evaluation materials (exam questions)

### Project

#### GLOBALIZATION

Computer ownership is growing worldwide and providing access to productivity tools and a global communications infrastructure. For this project, look for statistics and graphs showing the increase in computer ownership over time. How does it compare to telephone, television, and radio ownership? Are any aspects of this data unexpected or surprising? Gather your graphs and analysis into a two- to three-page executive summary.

#### ISSUE

The Issue section of this chapter focused on the potential for discarded computers and other electronic devices to become a significant environmental problem. For this project, write a two- to five-page paper about recycling computers, based on information you gather from the Internet. To begin this project, consult the Computer Recycling InfoWeb (see page 107) and link to the recommended Web pages to get an in-depth overview of the issue. Next, determine the specific aspect of the issue you will present in your paper. You might, for example, decide to focus on toxic materials that end up in landfills or barriers that discourage shipping old computers across national borders. Whatever aspect of the issue you present, make sure you can back up your discussion with facts and references to authoritative articles and Web pages. Follow your professor's instructions for formatting citations and for submitting your paper by e-mail or as a printed document.

General Information Information is readily available on the Internet about computer disposal and recycling. Learn the most basic aspects of computer recycling by reading the page [www.earth911.org/](http://www.earth911.org/). Here you'll find a comprehensive FAQ covering many of the elementary facts about computer recycling. You can also learn about different approaches to computer recycling at the following list of sites:

[gdi.ce.cmu.edu/comprec/](http://gdi.ce.cmu.edu/comprec/)

<http://www.techsoup.org/products/recycle/index.cfm>

[www.usedcomputer.com/nonprof.html](http://www.usedcomputer.com/nonprof.html)

[www.computerhope.com/disposal.htm](http://www.computerhope.com/disposal.htm)

These sites describe what is being done now, and what can be done in the future, to alleviate the growing problem of PC disposal.

Ways to Recycle Your Own Computer With millions of computers so quickly becoming obsolete, what are people and companies doing with them? It turns out that we seem to tuck older computers away in closets and in basements. Read the New York Times article ([gdi.ce.cmu.edu/comprec/nytimes98/12die.html](http://gdi.ce.cmu.edu/comprec/nytimes98/12die.html)) for information about what happens to old computers. This article includes many clever tips about what you can do with your old PC and electronic devices; from making a cool fish tank, to making your cat a new litter box!