

# Основы математической обработки информации

**Маслак Анатолий Андреевич,**  
доктор технических наук, профессор,  
зав. лабораторией объективных измерений  
E-mail [anatoliy\\_maslak@mail.ru](mailto:anatoliy_maslak@mail.ru)

# Основы математической обработки информации

Лектор: Маслак Анатолий Андреевич, дтн, проф.

К-во аудиторных часов	32 ч.
в том числе лекций	16 ч.
практических занятий	16 ч.
Лабораторных занятий	нет
Самостоятельная работа	40 ч.
Форма итогового контроля	зачет

# Группы

Группа	Всего	22.03				
18-ИМ						
18-ЭТ						
18-НД						
18-ФК						
18-АН						
18-ИО						
16-ФИЛ						

# Роль математики

Математические методы обработки информации давно уже востребованы не только в математических и естественнонаучных, но и в гуманитарных исследованиях.

Поэтому владение ими становится обязательной характеристикой компетентного специалиста.

Математическая обработка даёт возможность прогнозировать события на основе полученных данных.

Именно поэтому предмет «Основы математической обработки информации» (ОМОИ) (с небольшими вариациями названия) включен в учебные планы высшей школы на всех факультетах.

# Взаимосвязь образования и науки?

# Основные функции науки

1. Описание явлений и процессов  
(выявление значимых факторов)

2. Прогноз  
(выявление закономерностей)

# Роль математической статистики в прикладных и научных исследованиях

В древности было три источника информации:

- религия;
- мнение авторитетов;
- эксперимент.

«Статистическое мышление станет такой же необходимостью в жизни как умение читать и писать»

Герберт Уэллс

«Есть маленькая ложь, есть большая ложь, а есть еще и статистика»

# Актуальность изучения статистических методов

«Мы живем в вероятностном мире»

«Жизнь – это школа вероятности»

«В XXI веке умение пользоваться  
статистическими методами станет  
такой же необходимостью, как умение  
читать и писать»

Герберт Уэлс



# Роль математической статистики в прикладных и научных исследованиях

Наличие ошибки – принципиально существенный компонент во всех статистических исследованиях.

Перед ошибками захлопываем дверь. В смятение Истина: «Как я войду теперь?»»

Рабиндранат Тагор

«Сотри случайные черты - и ты увидишь: мир прекрасен»

А.Блок

Наиболее важный принцип экспериментирования «рандомизация» состоит в том, что случайность намеренно вносится в эксперимент.

# Разделы математической статистики

1. Описательная статистика
2. Теория статистического вывода
3. Планирование и анализ эксперимента

Today's world is changing by the minute. So teachers have to prepare students for a world that is totally unknown, for jobs that don't exist yet.

How to optimally prepare students for a world changing at an unprecedented rate? This is a profound question. Knowing that Education is one of the most powerful instruments of change.

In particular students should acquire proper tools to confront and analyze uncertainties. As the development of history is non-linear, non-deterministic, we should teach them how to expect, how to handle the unexpected. Because, by definition, the new is not predicted.

# Dimensions of innovation/change:

- 1) new *materials*: e.g. computers, educational software, open source materials, etc.,
- 2) new *teaching approaches*: e.g. students working more independent of the teachers, often in small groups on projects with the teacher in a different role
- 3) new *beliefs* about what is good education: e.g. assumptions about what should be taught and about what are appropriate methods.

# ***Change is process, not an event!***

- Not reasonable to expect schools and teachers to change at 'a point in time'
- Schools may introduce step-by-step new elements in their curriculum and pedagogical approaches
- Different schools may decide for different emphases and priorities!

***There are many ways leading to Rome***

# Model of 21<sup>st</sup> century education

In general, early questions are more self-oriented: What is it? And how will it affect me?

When these questions are resolved, questions emerge that are more task-oriented: How do I do it? How can I use these materials efficiently? How can I organize myself? and why is it taking so much time?

Finally, when self- and task concerns are largely resolved, the individual can focus on impact. Teachers may ask: Is this change working for students? and is there something that will work even better?

# *Did you know?*

- The projected top ten in demand jobs in 2010 did not exist in 2004 (US Secr. of Educ.)
- We are currently preparing students for jobs that do not exist, where they will use technologies that haven't been invented yet to solve problems we don't even know are problems yet
- Reported about *Google that:*  
in 2006 up to 2.7 billion searches/month  
in 2009: 31 billion searches/month!

# Lifelong learning skills:

In new circumstances, people being able

- to generate and evaluate answers to open, non-standardized questions,
- to set own learning goals,
- to plan and regulate own learning
- to evaluate own progress

**Need for  
analytical, creative and synthesizing skills**



# Demands

- Solve unforeseen problems
- Learning new things at work
- Able to choose or change methods at work
- Undertaking complex tasks
- Doing monotonous tasks at work

# '21st Century' skills

## I. Ways of thinking

1. *Creativity and Innovation*
2. *Critical Thinking, Problem Solving, Decision Making*
3. *Learning to Learn*

## II. Ways of working

4. *Communication*
5. *Collaboration (Teamwork)*

# '21st Century' skills

## **III. Tools for working**

*6. Information Literacy (includes research)*

*7. ICT Literacy*

## **IV. Living in the world**

*8. Citizenship – Local and Global*

*9. Life and Career*

*10. Personal & Social Responsibility – incl.  
Cultural Awareness and Competence*

# '21st Century' skills

Each skill elaborated in three categories:

- ***Knowledge:*** references to specific knowledge or understanding required
- ***Skills:*** abilities, skills and processes which are focus for learning
- ***Attitudes, Values, Ethics:*** behaviors and aptitudes that students exhibit in relation to each of the 10 competencies

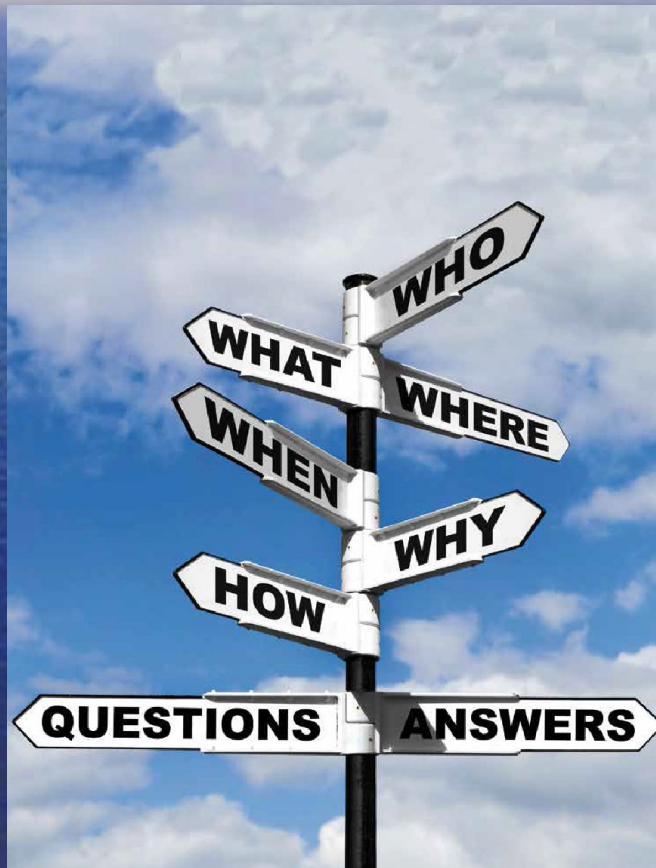
# Possible shifts in pedagogy

	<i>Less</i>	<i>More</i>
<i>School</i>	Isolated from society	Integrated in society
	Most information on school functioning confidential	Information openly available
<i>Teacher</i>	Initiator of instruction	Helps students find appropriate instruct path
	Whole class teaching	Guides students' independent learning
	Evaluates student	Helps student to evaluate own progress
	Places low emphasis on communication skills	Places high emphasis on communication skills

# Possible shifts in pedagogy (contd)

	<i>Less</i>	<i>More</i>
<b><i>Student</i></b>	Mostly passive	More active
	Learns at school	Learns also outside school
	Hardly any teamwork	Much teamwork
	Takes questions from books or teachers	Asks questions OR generates them (projects)
	Learns answers to questions	Finds answers to questions
<b><i>Learning outcomes</i></b>	Emphasis on reproductive skills	Emphasis on productive skills

See\* also Voogt (2003)



**Благодарю за внимание!**