



НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ
МОРДОВСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ

Modification of math courses in Russian universities

In the framework of METAMATH project

- **LETI**: Saint Petersburg Electrotechnical University;
- **NNSU**: Nizhny Novgorod State University;
- **KRNTU – KAI**: Kazan National Research Technical University – KAI;
- **TSU**: Tver State University;
- **OMSU**: Ogarev Mordovia State University;
- **Brief summary.**





LETI
Saint Petersburg Electrotechnical University



LETI

www.mrsu.ru

Main focus – *Mathematical logic and theory of algorithms:*

- Boolean functions and logical schemes.
- First-order logic.
- Theory of algorithms.

$$\{\&, \vee, \neg\}$$

Totally 109 exercises (all with multiple versions) were developed and placed in Moodle:

- 93 exercises grouped in 19 tests developed in TAO (<https://www.taotesting.com/> is a free test-creation system).
- 16 exercises developed within LETI's own subject manipulators.





NNSU
Nizhny Novgorod State University



NNSU

www.mrsu.ru

Two courses – *Calculus* and *Mathematical modelling*.

The directions of modification:

- More seminars and consultations – less lectures.
- Intensification of students' independent work. E.g., some theoretic material (proofs etc.) left for independent work.
- New topics and a large amount of engineering examples were included in the curricula.
- Mandatory regular testing students during the term (using Math-Bridge).
- Project work.

$$\int_a^b f(x) dx = F(b) - F(a)$$





Thanks to the project work technology, students become ***more interested*** in learning. They even ask the teacher to organize the defense of the project when it isn't necessary.:-)

In progress:

- Renewal of topics' list for projects in Mathematical modelling. This new list will be tightly connected with math modelling applications in IT-development (will be done to the beginning of the next academic year).





KRNTU – KAI
Kazan National Research
Technical University – KAI



KRNTU – KAI

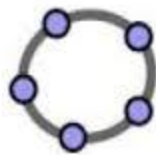
www.mrsu.ru

Main focus – *Optimization methods (MSc course):*

- One-dimensional optimization.
- Linear optimization.
- Nonlinear optimization.
- Constrained optimization.

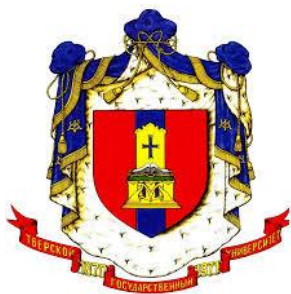
Electronic support:

- E-book with theoretical course in Math-Bridge: **3** chapters, **8** subchapters, **13** pages, **87** static learning objects (methods, definitions, theorems, etc.), **12** dynamic learning objects (exercises).
- **12** GeoGebra objects included in Math-Bridge e-book.
- Pretest in Math-Bridge with **20** exercises.
- Posttest in Math-Bridge with **20** exercises.



GeoGebra





TSU

Tver State University



TSU

www.mrsu.ru

Two courses – *Probability Theory* and *Fuzzy Logic and Theory of Uncertainty*.



The directions of modification:

- Mandatory bridging course (sets, functions, etc.).
- Moodle is used for knowledge assessment (auxiliary exercises).
- Motivation lectures are added at the beginning of every course that explain connection of the disciplines with the real world problems.
- **4 + 2** project works were introduced in the courses (student/group of students have to solve some real-life example problem where currently studied mathematical tools are key parts of the solution).
- Modernization of *Uncertainty Theory and Fuzzy Logic* course: more practice oriented topic was introduced (fuzzy controllers and examples of their industrial applications).



Statistics on *bridging course*:

- 7 lectures, 106 examples, 262 exercises (placed in Moodle).

Statistics on *Probability theory*:

- Classical probability. Combinatorics.
- Geometrical probability.
- Conditional probability. Independence of random variables.
- The sequence of tests. Bernoulli scheme. Binomial distribution. Limit theorems in Bernoulli scheme.

Totally 129 practice-oriented exercises developed (partly placed in Moodle: 2 sections with 40 exercises).





OMSU
Ogarev Mordovia State University



OMSU

www.mrsu.ru

Two courses – *Algebra and Geometry* and *Discrete Maths*.

The directions of modification:

- Pre- and posttests are developed for every course (32 and 30 exercises both pre- and post- for AlGeo and DM).
- Bridging courses were set up for *all* STEM-profiles in OMSU.
- More engineering and practical examples.
- Computer programming workshops for students of IT-profiles.
- Math-Bridge e-course in AlGeo is implemented: 12 chapters, 56 pages, 226 static learning objects, 176 dynamic learning objects.
- Math-Bridge e-course in DM is implemented: 4 chapters, 20 subchapters, 53 pages, 440 static learning objects, 45 dynamic learning objects.
- GeoGebra was used in teaching AlGeo.



Unexpected result:

When Math-Bridge was used in teaching AIGeo for «mathematically-strong» students (Informatics and Computer Science, Software Engineering profiles) the intensity of Math-Bridge using had little effect on the study results.

But when it was used by the students of «weaker» profile (Infocommunicational Technologies and Commutation Systems profile) the effect was great. All the students passed the exam with only one try (50% students of the profile failed without Math-Bridge a year earlier).

So... Math-Bridge works.:-)



Brief summary



The main directions of modifications:

- E-learning is used (platforms: Moodle, Math-Bridge, maybe others).
- Independent work of students becomes more intensive.
- Courses become more practically oriented.
- Bridging courses are developed.
- Project work is used.





НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ
МОРДОВСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ

Thank you for your attention!

www.mrsu.ru