«The Moscow State University of Geodesy and Cartography is the education centre for graduation of international specialists of the global navigation satellite systems”

President of the MIIGAIK - Prof. Victor Savinych,
Rector of the MIIGAIK- Prof. Prof. Andrey Maiorov ,
Prof.,MIIGAIK, the Deputy of the CEO of Association GLONASS/GNSS Forum, Andrey Kupriyanov

Ninth Meeting of the International Committee on Global Navigation Satellite Systems (ICG-9),
10 to 14 November 2014, Prague, Czech Republic
MIIGAIK
1779-2014
RUSSIAN FEDERATION - has two higher education institutions geodesy and cartography profiles
   • (bachelors programme, specialisation,
   • master's degree programme, graduate school, doctoral candidacy, extended education, professional development.

The major disciplines are: applied geodesy, astronomy-geodesy, aerial survey, space geodesy and navigation, cartography, remote sensing, applied informatics in geodesy, land registry, cadastre, etc.

• Moscow State University of Geodesy and Cartography (MIIGAIK), Moscow
• Siberian State Academy of Geodesy (SGGA), Novosibirsk

At the present time, in MIIGAIK and SGGA are studying more than 10,000 students and the past graduates

The class of graduates is more than 1,000 annually.
The Educational Tutorial Association under MIIGAIK includes 24 higher education institutions of Russian Federation.

More than 600 students graduated at the chairs of geodesy of institutes and universities annually.
MIIGAİK is developing of educational programmes for different GNSS/GLONASS applications
The main specialities in MIIGAIK

- **GEODESY** (Applied geodesy, Astronomo-geodesy, Space geodesy)
- Photogrammetry and remote sensing,
- Aerial survey (Remote sensing and monitoring of the Earth from space)
- Laser equipment and laser technology
- Information systems and information technologies
- Applied informatics (in survey, in informatics systems)
- Management and technologies of information protection
- Land management and land cadastre (Municipal cadastre)
- Cartography
- Optic-electronic equipment and systems
- Jurisprudence
- Finance and credit
- State and municipal management
- Enterprise management
GNSS SPECIAL COURSES

• Base course: Global Navigation Satellite Systems
• Space Geodesy
• Space Navigation
• Orbital Methods
• GNSS reference networks applications for monitoring of global, regional and local geodynamic, etc., etc
• Survey technologies, methods and equipment on base of GNSS signals
• Monitoring of Constructions
The education structure of Moscow State University of Geodesy and Cartography consist on several levels:

- Pre-higher education professionally oriented with high-school children, including distance education,
- Bachelor's program
- Specialization
- Extended education, Professional development
- Master’s degree program
- Graduate school
- Doctoral candidacy
MASTER'S DEGREE PROGRAM

• “GEOGESY”
  
  **GNSS technologies in geodesy**, physical geodesy, geodetics methods for study of Earth geodynamic processes, the Earth gravitation study, astronomy-geodesy, space astrometry, theory of celestial mechanics, mathematical astronomy, gravitational astronomy, theory of motion of satellites and the orbit determination on base of on board measurements, geodetics applications for municipal administrations, mathematical treatment of measurements, software development, aero and space imaging, photogrammetry and phototopography, space remote sensing, charts and atlases design, graphics and revision, geoinformation technologies, cadastre, land and real estate monitoring and inventory etc.

• “OPTO-TECHNOLOGIES”

• Applied optics, Optics and Optoelectronic equipment, Laser equipment
POST-GRADUATE EDUCATION, GRADUATE SCHOOL

• Geodesy (INCLUDES ALL GNSS APPLICATIONS)
• Cartography (INCLUDES ALL GNSS APPLICATIONS)
• Land management, cadastre and land monitoring (INCLUDES ALL GNSS APPLICATIONS)
• Aerospace research of Earth, photogrammetry (INCLUDES ALL GNSS APPLICATIONS)
• Geoinformatics (INCLUDES ALL GNSS APPLICATIONS)
• Optical and optoelectronic equipment and systems
• Geoecology (INCLUDES GNSS APPLICATIONS)
• Economy and management of nation’s economy (in sectors including economy, development and management of enterprises, industry branches, complexes)
The next level of mass service – precision positioning

The development of ground infrastructure of high-precision navigation system
Education courses developed by MIIGAIK in accordance with Federal “GLONASS” program under management of Roskosmos and JSC “Russian Space Systems”:

- The following training courses for GNSS Applications were developed: satellite navigation, cadastral and land planning work with GNSS technologies, land and real estate state inventory, geodetic networks, satellite technologies in earthquake regions, for geodynamics, railroad and VTS monitoring, constructions deformation monitoring. “GNSS (GLONASS) technologies for the inventory of real estate lands and objects, digital mapping, topographic surveying and monitoring linear constructions (oil- and gas pipelines, power transmission lines)
Since the late 80s the Russian Federation has begun to apply commercial satellite equipment and technology. At the first stage it was receivers with code measurements for maritime and ground navigation, survey. Meritime and aviation application were under IMO and ICAO requirements and regulations.

Education programs in commercial application of precision technology and equipment were first of all in survey, cadastre, land and ground infrastructure inventory. The major sector of application were oil&gas, survey and mining. The methods of field applications for training courses were static, pseudo kinematic.
The next level of educations courses was development, improvement of technology equipment for commercial application - RTK-kinematics in real time, kinematics with moving base base stations, transmission of differential corrections

Training courses for (regional, local) reference networks for various applications based on GLONASS/GNSS
Direction courses for specialists in high-precision applications of GLONASS / GNSS technology and equipment:

- Monitoring of ground infrastructures, oil and gas pipelines, geophysical survey and other work on the continental shelf

- Machine control - road construction with centimeter accuracy, using technology and real-time reference stations, digital maps
GLONASS/GNSS monitoring systems of buildings, bridges, dams - Precision control system using local reference systems, data transmission systems, software analysis for decision making
Increasing informational content, coordinate and time providing rolling stock

High-precision monitoring of objects of transport infrastructure, keeping and creating united digital cartographical basis
RTK is the main open cut mining GNSS technology

-Precision agriculture develops intensively in private sector using local differential networks, precision steering systems can now run on commercial market.
Areas of application of GLONASS

- Positioning of power lines masts;
- Monitoring of hydroelectric power stations;
- Control of transport mobile means of emergency services in real time;
- Tracing of power lines by means of geo information systems and technologies of aerial photography;
- Synchronization with help of technologies of satellite navigation.
The purpose of the education program is to add or to implement in GNSS general curriculum the applications courses in accordance with the main strategic directions - GLONASS popularization, social economic development, different applications of GNSS technologies and equipment.
The training course «GNSS (GLONASS) APPLICATION FOR STATE REFERENCE NETWORKS»

- Students will have practical knowledge in technical design, optimization of network structure, equipment and software of GNSS used in state reference networks.
... and many others will:
accelerate GNSS information drive
make contribution to International GNSS society push forward development new education courses for training specialists in deformation monitoring, homeland security, precision agriculture, transportation, ITS, survey, construction,... mass introduction of GNSS/GLONASS-GPS-BEIDOW-GALILEO navigation technologies.
Different countries – providers of GNSS, created education process and retraining programs on base of geographical location, economy characteristics, mining of natural recourses, oil&gas transportation, transport infrastructure, precision agriculture, machine control etc.,etc

The “GNSS/GLONASS –EDUCATION” could be the integrated part of international program GNSS application training and continuing education of specialists in different branches of economy including UN affiliated educational Centers
THANK YOU!

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Спасибо за внимание!