

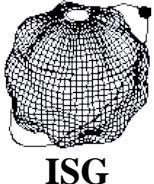
**XV - INTERNATIONAL SCHOOL OF  
“THE DETERMINATION AND USE OF THE GEOID”**

**from April 7 to 11, 2025  
Kazakhstan, Almaty**



**Final Report**  
**15th International School on**  
**“The Determination and Use of the Geoid”**  
**April 7 to 11, 2025**

**Institute of Ionosphere, Almaty, Kazakhstan**



## 15th International School on “The Determination and Use of the Geoid”

April 7–11, 2025

Institute of Ionosphere, Almaty, Kazakhstan

The 15th International School on “The Determination and Use of the Geoid” took place in Almaty, Kazakhstan, from April 7 to 11, 2025. The event was organized by the Institute of Ionosphere in collaboration with the International Service for the Geoid (ISG) and the International Association of Geodesy (IAG).

This edition represented a landmark achievement, being the first occurrence of the School in Central Asia, thereby reflecting the region’s growing prominence and strategic relevance in the domain of global geodetic research.

The School was specifically designed to train graduate students, early-career researchers, and specialists from national geodetic agencies and academic institutions in the determination and application of gravimetric geoids for a broad spectrum of scientific and technical geodetic applications. It provided participants with a unique opportunity to acquire practical skills in state-of-the-art methods of geoid computation and to foster international cooperation among experts engaged in the modeling of the Earth’s gravity field.

Structured as an intensive, week-long program, the School offered a well-balanced combination of theoretical lectures and practical workshops, encompassing such topics as global geopotential models, satellite gravimetry missions (including GRACE and GOCE), and various techniques for geoid determination. Attendees were introduced to specialized computational tools and became acquainted with different methodological approaches, such as the Stokes integral formula and Least Squares Collocation.

A significant focus was placed on the role of gravimetric geoid modeling in the realization of the International Height Reference Frame (IHRF) and in supporting the implementation of the Global Geodetic Reference Frame for Sustainable Development (GGRF). These international frameworks are essential for the harmonization and modernization of national vertical datums.

An important emphasis of the School was the promotion of collaboration between the scientific community and national geodetic services, encouraging the integration of advanced geodetic methodologies into operational geospatial infrastructure projects and national height reference systems.

All activities were conducted in person in Almaty, with English as the official working language, ensuring effective communication and facilitating professional networking and knowledge exchange among a diverse group of international participants.

## Faculty

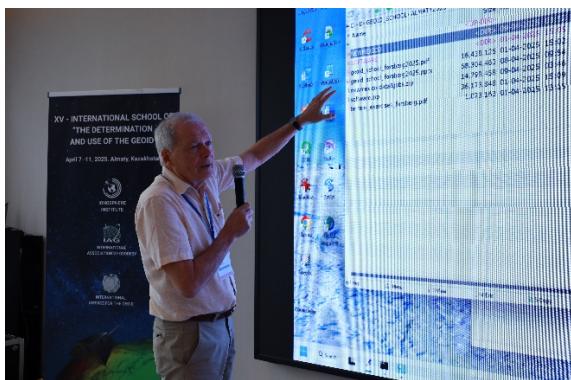
- Prof. Riccardo Barzaghi (Politecnico di Milano, Italy) (in person).
- Prof. Adrian Jäggi (Astronomical Institute, University of Bern, Switzerland) (In person).
- Prof. Rene Forsberg (Technical University of Denmark, DTU, Denmark). (In person).
- Prof. Laura Sánchez (DGFI-TUM), Germany. (In person).



**Prof. Riccardo Barzaghi**  
Politecnico di Milano  
(POLIMI)  
Milan, Italy



**Prof. Adrian Jäggi**  
Astronomical Institute, University of Bern  
(AIUB)  
Bern, Switzerland



**Prof. Rene Forsberg**  
Technical University of Denmark  
(DTU Space)  
Lyngby, Denmark



**Prof. Laura Sanchez**  
Deutsches Geodätisches Forschungsinstitut,  
Technische Universität München  
(DGFI-TUM)  
München, Germany

## Organizing Committee

- Serik Nurakynov (Director of Institute of Ionosphere, Kazakhstan)
- Daniela Carrion (Director of ISG, Politecnico di Milano, Italy)
- Mirko Reguzzoni (President of ISG, Politecnico di Milano, Italy)
- Daniya Shoganbekova (Institute of Ionosphere, Kazakhstan)
- Asset Urazaliyev (Institute of Ionosphere, Kazakhstan)

# Final school program

| Date              | Start time | End time | Lecturer                                 | Topic   |
|-------------------|------------|----------|--|---|
| <b>Monday</b>     |            |          |  |   |
| 07/04/2025        | 8.00       | 8.50     |  | Registration  |
|                   | 8.50       | 9.00     | Serik Nurakynov                          | Welcome, opening  |
|                   | 9.00       | 10.30    | Prof. Riccardo Barzaghi                  | <b>General theory on gravity field</b><br><b>General Theory for Geoid Computation</b>   |
|                   | 10.30      | 11.00    | Coffee break                             |   |
|                   | 11.00      | 13.00    | Prof. Riccardo Barzaghi                  |   |
|                   | 13.00      | 14.00    | Lunch time                               |   |
|                   | 14.00      | 15.30    | Prof. Riccardo Barzaghi                  |   |
|                   | 15.30      | 16.00    | Coffee break                             |   |
|                   | 16.00      | 17.00    | Prof. Riccardo Barzaghi                  |   |
| <b>Tuesday</b>    |            |          |  |   |
| 08/04/2025        | 9.00       | 10.30    | Prof. Adrian Jäggi                       | <b>Global geopotential models and practical exercises</b>   |
|                   | 10.30      | 11.00    | Coffee break                             |   |
|                   | 11.00      | 13.00    | Prof. Adrian Jäggi                       |   |
|                   | 13.00      | 14.00    | Lunch time                               |   |
|                   | 14.00      | 15.30    | Prof. Adrian Jäggi                       |   |
|                   | 15.30      | 16.00    | Coffee break                             |   |
|                   | 16.00      | 17.00    | Prof. Adrian Jäggi                       |   |
| <b>Wednesday</b>  |            |          |  |   |
| 09/04/2025        | 9.00       | 10.30    | Prof. René Forsberg                      | <b>Terrain effect computation and remove/restore and practical exercises</b>  |
|                   | 10.30      | 11.00    | Coffee break                             |   |
|                   | 11.00      | 13.00    | Prof. René Forsberg                      |   |
|                   | 13.00      | 14.00    | Lunch time                               |   |
|                   | 14.00      | 15.30    | Prof. René Forsberg                      |   |
|                   | 15.30      | 16.00    | Coffee break                             |   |
|                   | 16.00      | 17.00    | Prof. René Forsberg                      |   |
| <b>Thursday</b>   |            |          |  |   |
| 10/04/2025        | 9.00       | 10.30    | Prof. Riccardo Barzaghi                  | <b>Residual geoid estimation. The Collocation Method in Geodesy</b><br><b>Practical exercises: residual geoid estimation</b><br><b>The FFT Methods to Geodesy</b> |
|                   | 10.30      | 11.00    | Coffee break                             |   |
|                   | 11.00      | 13.00    | Prof. Riccardo Barzaghi                  |   |
|                   | 13.00      | 14.00    | Lunch time                               |   |
|                   | 14.00      | 15.30    | Prof. Riccardo Barzaghi                  |   |
|                   | 15.30      | 16.00    | Coffee break                             |   |
|                   | 16.00      | 17.00    | Prof. Riccardo Barzaghi                  |   |
| <b>Friday</b>     |            |          |  |   |
| 11/04/2025        | 9.00       | 10.30    | Prof. Laura Sanchez                      | <b>Height systems and vertical datum unification</b>  |
|                   | 10.30      | 11.00    | Coffee break                             |   |
|                   | 11.00      | 12.00    | Prof. Laura Sanchez                      |   |
|                   | 12.00      | 13.00    | Lunch time                               |   |
|                   | 13.00      | 14.00    | Departure to the Institute of Ionosphere |   |
|                   | 14:00      | 14:30    | Overview of the Institute's Activities   | <b>Official Award Ceremony for Participants of the International School (at the Institute of Ionosphere)</b>  |
|                   | 14.30      | 15.00    | Awarding of Certificates                 |   |
|                   | 15.00      | 15:15    | Coffee break                             |   |
|                   | 15:20      | 16:00    | Return to Conference Hall Area           |   |
| <b>Roundtable</b> |            |          |  |   |
| 11/04/2025        | 15:15      | 18:00    | Round Table Session                      | <b>Development and Implementation of National Vertical Reference Systems</b>  |
|                   | 18:00      | 18:30    | Leaving the Institute for Dinner         |   |
|                   | 18:30      | 21:30    | Dinner                                   |   |

## Participants

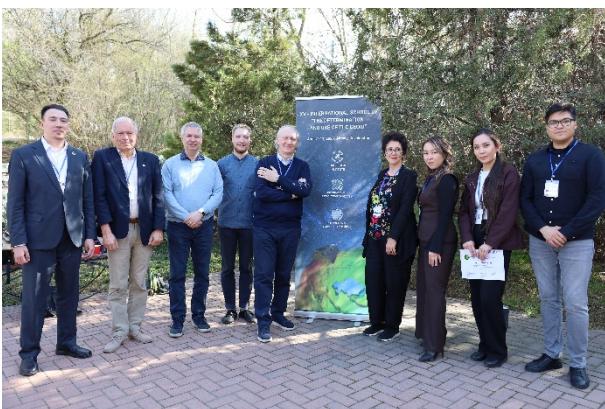


Group photo



Training sessions





Geoid School Closing and Certificate Awards

## Participants of the Geoid School

There were 32 participants registered for training at the school.

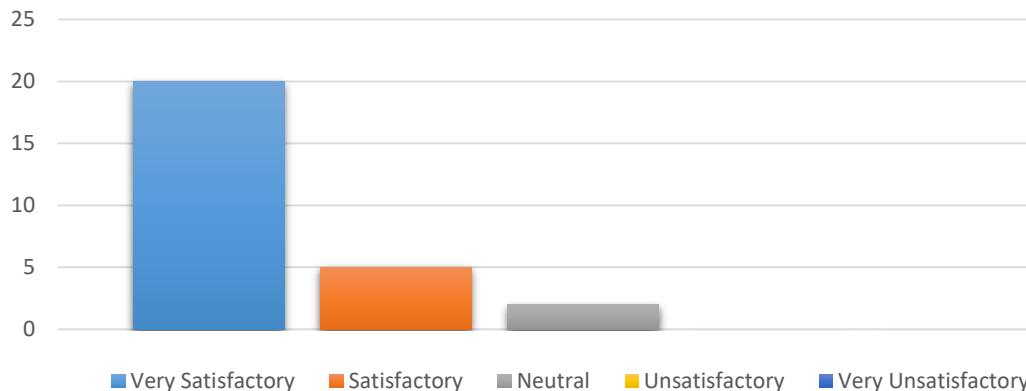
| Nº | Country    | Name    | Surname      | Organization  | e-mail   |
|----|------------|---------|--------------|---|--|
| 1  | Denmark    | Bjørnar | Dale         | DTU Space, Technical University of Denmark  | <a href="mailto:baada@space.dtu.dk">baada@space.dtu.dk</a>                             |
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| 3  | Kazakhstan | Ainur   | Yerzhankzy   | JSC "Kazakh National Research Technical University named after K.I. Satpayev"   | <a href="mailto:a.yerzhankzy@satbayev.university">a.yerzhankzy@satbayev.university</a> |
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| 5  | Kazakhstan | Nurgan  | Kemerbayev   | «GeOID» LLP   | <a href="mailto:nurgank@mail.ru">nurgank@mail.ru</a>                                   |
| 6  | Kazakhstan | Inkar   | Meiramkhan   | «GeOID» LLP   | <a href="mailto:inkarmeiramkhan@gmail.com">inkarmeiramkhan@gmail.com</a>               |
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| 9  | Kazakhstan | Arman   | Shinguzhinov | RSE «National Centre of Geodesy and Spatial Information»  | <a href="mailto:armani_5577@mail.ru">armani_5577@mail.ru</a>                           |
| 10 | Kazakhstan | Mikhail | Merkulov     | RSE «National Centre of Geodesy and Spatial Information»  | <a href="mailto:mihailmerkulov802@gmail.com">mihailmerkulov802@gmail.com</a>           |
| 11 | Kazakhstan | Arafat  | Zhaisanbayev | "Comprehensive Survey Center" LLP   | <a href="mailto:araphat90@gmail.com">araphat90@gmail.com</a>                           |
| 12 | Kazakhstan | Amir    | Beisembayev  | "Comprehensive Survey Center" LLP   | <a href="mailto:pro100amir00@gmail.com">pro100amir00@gmail.com</a>                     |
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| 15 | Kazakhstan | Magzhan | Kozhakhmetov | «Institute of Ionosphere» LLP   | <a href="mailto:magzhan.kozhakhmetov@gmail.com">magzhan.kozhakhmetov@gmail.com</a>     |
| 16 | Kazakhstan | Nailya  | Zhaksygul    | «Institute of Ionosphere» LLP   | <a href="mailto:nailyazhaksygul@mail.ru">nailyazhaksygul@mail.ru</a>                   |
| 17 | Kazakhstan | Lyailya | Satybaldina  | Department of Geodesy and Cartography of the Ministry of Digital Development, Innovation and Aerospace Industry of the Republic of Kazakhstan | <a href="mailto:leyla_ss@list.ru">leyla_ss@list.ru</a>                                 |
| 18 | Belarus    | Olga    | Bondar       | Department for the Formation and Maintenance of the Geodetic Data Base of the RSE "Belgeodesy"  | <a href="mailto:olgacupper@gmail.com">olgacupper@gmail.com</a>                         |
| 19 | Belarus    | Elena   | Goridovets   | Department for the Formation and Maintenance of the Geodetic Data Base of the RSE "Belgeodesy"  | <a href="mailto:hegtopaska1760@gmail.com">hegtopaska1760@gmail.com</a>                 |

|    |            |             |             |   |  |
|----|------------|-------------|-------------|---|--|
| 20 | Belarus    | Aleksei     | Melekhin    | Department for the Formation and Maintenance of the Geodetic Data Base of the RSE "Belgeodesy"  | <a href="mailto:melleshka@gmail.com">melleshka@gmail.com</a>                     |
| 21 | Kyrgyzstan | Tatyana     | Golubenko   | Department of Geospatial Data Processing of the State Institution for Geodesy and Cartography "Goskartografiya" under the Land Agency | <a href="mailto:golubenko.t@mail.ru">golubenko.t@mail.ru</a>                     |
| 22 | Kyrgyzstan | Kubanychbek | Koshoev     | Department of Geospatial Data Processing of the State Institution for Geodesy and Cartography "Goskartografiya" under the Land Agency | <a href="mailto:Kubanychbek_Koshoev@mail.ru">Kubanychbek_Koshoev@mail.ru</a>     |
| 23 | Russia     | Irina       | Mezhenova   | Geodesy Department of the Geodesy and Metrology Directorate of the PLC "Roscadastr"   | <a href="mailto:irinamezhenova@gmail.com">irinamezhenova@gmail.com</a>           |
| 24 | Russia     | Alyona      | Dergilyova  | Geodesy Department of the Geodesy and Metrology Directorate of the PLC "Roscadastr"   | <a href="mailto:alyona3100@mail.ru">alyona3100@mail.ru</a>                       |
| 25 | Russia     | Ilmур       | Nevretdinov | Gravimetry Department of the Geodesy and Metrology Directorate of the PLC "Roscadastr"  | <a href="mailto:ilmur.nevretdinov@outlook.com">ilmur.nevretdinov@outlook.com</a> |
| 26 | Russia     | Ilya        | Oschepkov   | Geodesy Department of the Geodesy and Metrology Directorate of the PLC "Roscadastr"   | <a href="mailto:ilya.oshchepkov@gmail.com">ilya.oshchepkov@gmail.com</a>         |
| 27 | Armenia    | Gevorg      | Manukyan    | Cadastre Committee of the Republic of Armenia   | <a href="mailto:gevorg.manukyan@cadastre.am">gevorg.manukyan@cadastre.am</a>     |
| 28 | Armenia    | Karen       | Grigoryan   | Information Technology Center of the Committee of Real Estate Cadastre of the Republic of Armenia                                     | <a href="mailto:karen.grigoryan@cadastre.am">karen.grigoryan@cadastre.am</a>     |
| 29 | Kazakhstan | Aizhan      | Sakhariyeva | SPC «GEOKEN» LLP  | <a href="mailto:aizhaissa@gmail.com">aizhaissa@gmail.com</a>                     |
| 30 | Kazakhstan | Yeraly      | Kalen       | SPC «GEOKEN» LLP  | <a href="mailto:eralykalen1984@gmail.com">eralykalen1984@gmail.com</a>           |
| 31 | Kazakhstan | Almat       | Utesbayev   | RSE "State Institute of Agricultural Aerial Photographic Geodetic Surveys"  | <a href="mailto:Alan-ulani@mail.ru">Alan-ulani@mail.ru</a>                       |
| 32 | Kazakhstan | Yerbol      | Yermash     | RSE "State Institute of Agricultural Aerial Photographic Geodetic Surveys"  | <a href="mailto:yermashyerbol@gmail.com">yermashyerbol@gmail.com</a>             |

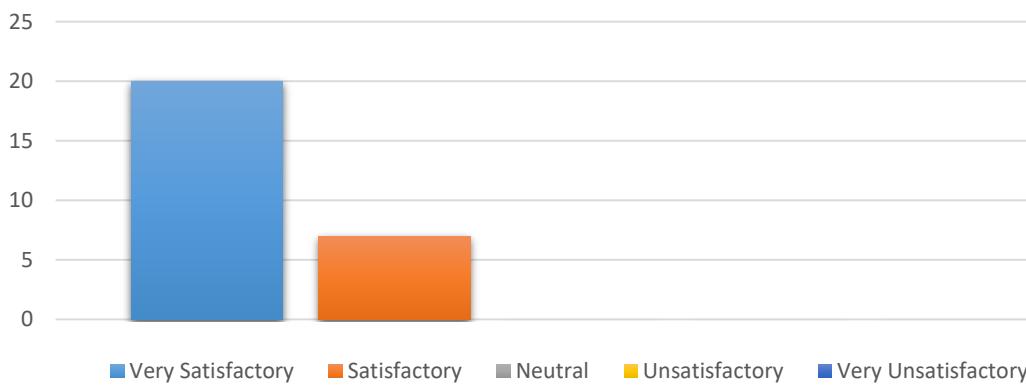
**Feedback questionnaire.** A satisfaction questionnaire has been filled up. The results are depicted in the following figures.

## Logistics

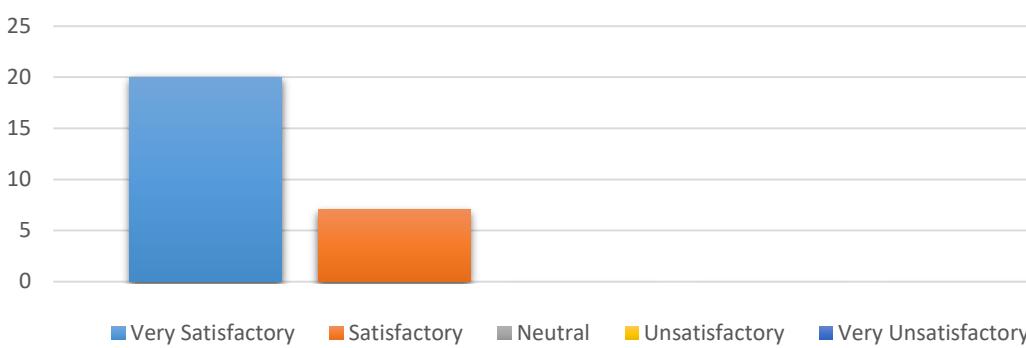
### How would you assess the ease of the registration process and course access?



### How appropriate were the course duration and schedule in meeting your needs?

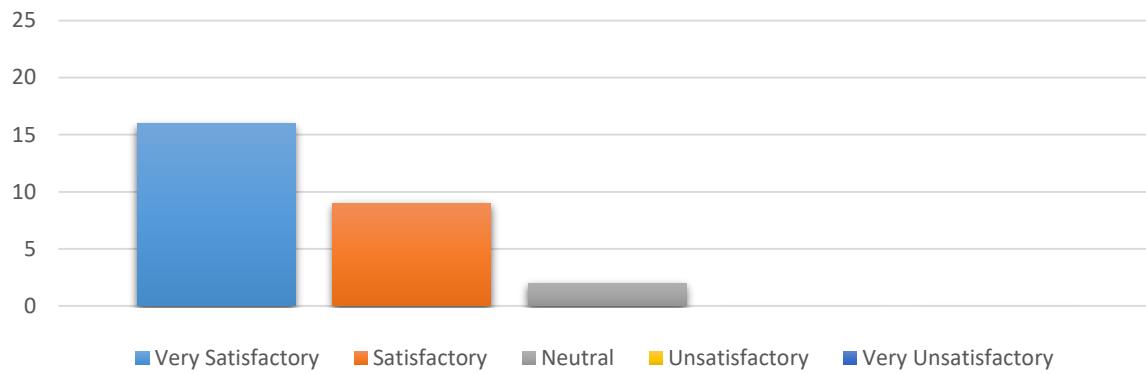


### How would you evaluate the convenience and overall quality of the facilities and logistical arrangements?

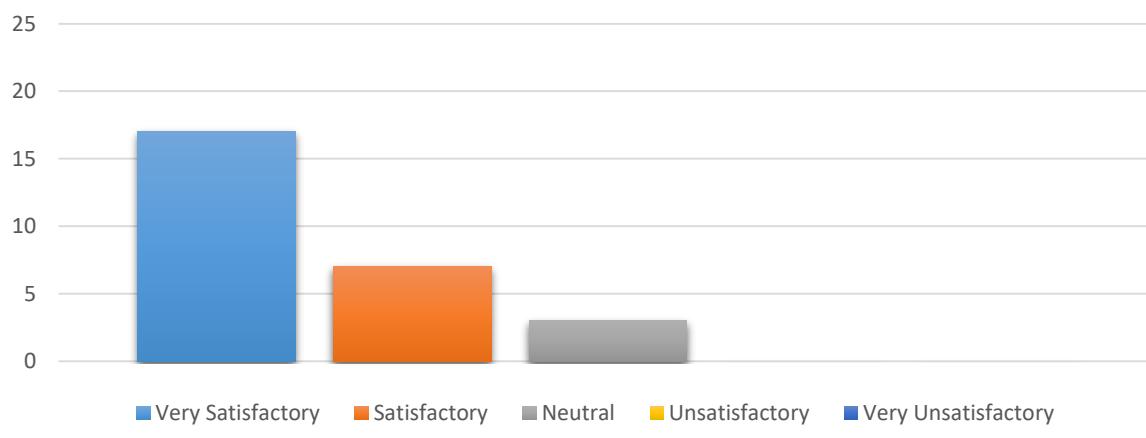


## Quality of Content

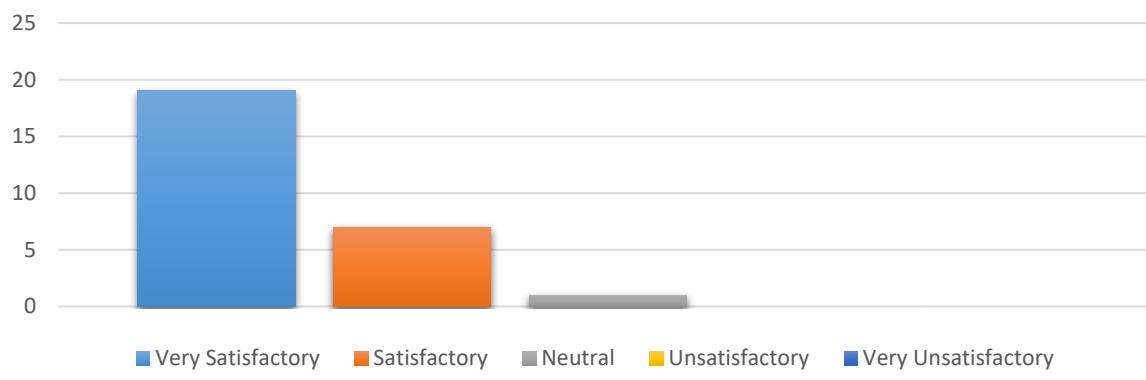
To what extent was the course content relevant and beneficial to your professional or academic interests?



How clear, logical, and easy to follow was the overall structure of the course?

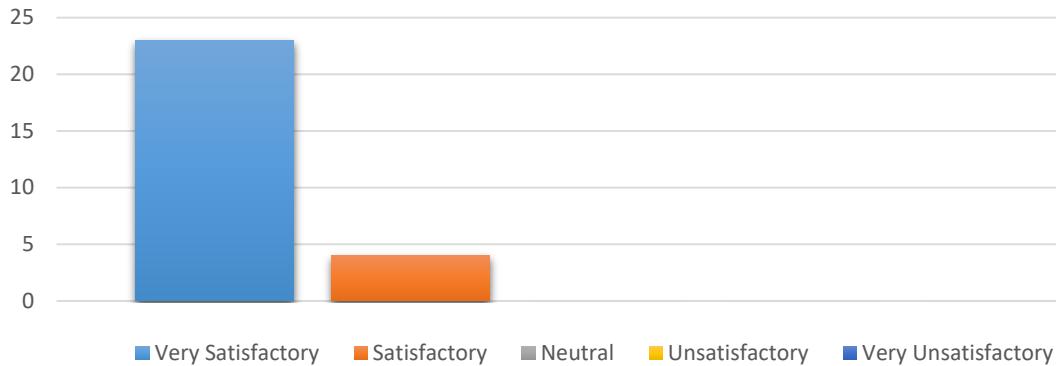


How would you rate the quality and effectiveness of the instructional materials (presentations, readings, practical exercises)?

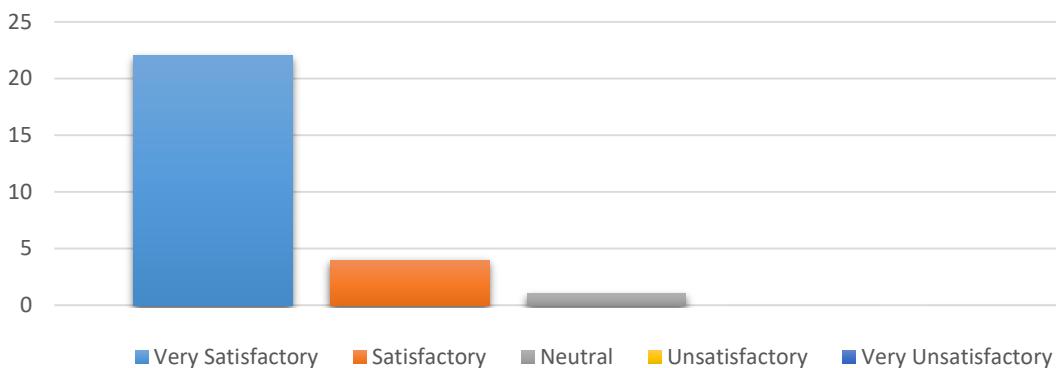


## Instructor Performance & Participant Support

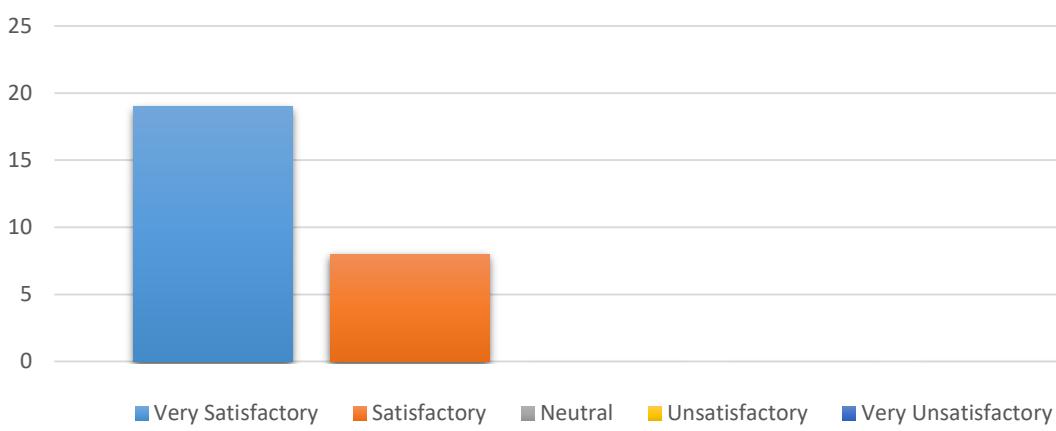
**How effective and responsive was the communication with administrative staff before and during the course?**



**How useful and supportive were the provided instructional materials (presentations, readings, practical exercises)?**



**Did you receive timely and constructive feedback on your performance and participation in the course?**



**Venue:**

Institute of ionosphere, Kamenskoe Plateau, Sadovodcheskoe tovarishestvo Ionosfera, 117 – Almaty, Republic of Kazakhstan.

**Distributed documents**

Presentations, software, data for exercises, and GRAVSOFT manual were distributed to the students.

Each student received a participation certificate.

**Round table:**

On April 11, 2025, the Institute of the Ionosphere hosted a round table on “Issues in Establishing and Implementing National Height Systems.” The event brought together over thirty representatives of the relevant agencies from CIS member states. Key expert input was provided by the lecturers of the International School on Geoid Determination—Prof. Riccardo Barzaghi (Italy), Prof. Rene Forsberg (Denmark), Prof. Adrian Jäggi (Switzerland), and Prof. Laura Sanchez (Germany)—who, in an open-dialogue format, commented on the proposed approaches and shared best practices. Thus, the round table not only identified the principal challenges and outlined potential solutions, but also laid a solid foundation for continued cooperation among specialized organizations and the international expert community.





Highlights of the round table