Construction of BDS/GNSS Teaching & Practice Courses

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Beihang University
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International Exchange and Training Center of CSNO
BeiDou International Exchange and Training Center was established on August 24, 2012 to prompt education and training for the purpose of the Applications of BDS in the world. 

**Location:** in the campus of Beihang University

(http://www.buaa.edu.cn)
Postgraduate Program on BeiDou/GNSS

- Program started since Sep. 2012.
- Until now, 135 master's and doctoral students from 22 countries are cultivated.

<table>
<thead>
<tr>
<th>1st: stage: Course Study in China (9 months)</th>
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<tbody>
<tr>
<td>Module 1: 2 months for fundamental courses</td>
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<tr>
<td>Module 2: 4 months for major courses</td>
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<tr>
<td>Module 3: 3 months for pilot project (practice)</td>
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<table>
<thead>
<tr>
<th>2nd stage: Thesis Research (6-12 months)</th>
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<tbody>
<tr>
<td>Module 1: Advanced Project</td>
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<tr>
<td>Module 2: Thesis preparation and defense</td>
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<tr>
<td>Module 3: Graduation and Granting Master’s</td>
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</tbody>
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Duration: 9 month + 1 year
Teaching Language: English

<table>
<thead>
<tr>
<th>Core Course</th>
<th>Class Hrs</th>
</tr>
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<tbody>
<tr>
<td>GNSS Reference System</td>
<td>18</td>
</tr>
<tr>
<td>Principle of Global Navigation Satellite Systems</td>
<td>32</td>
</tr>
<tr>
<td>GNSS Navigation Signal</td>
<td>18</td>
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<tr>
<td>GNSS Receiver Principles and Design</td>
<td>32</td>
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<tr>
<td>GNSS/INS Integration Navigation</td>
<td>32</td>
</tr>
<tr>
<td>Global Satellite Navigation System Applications</td>
<td>18</td>
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<tr>
<td>Satellite Navigation Data Processing</td>
<td>32</td>
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<tr>
<td>GNSS Experiment</td>
<td>18</td>
</tr>
<tr>
<td>GNSS New Technologies</td>
<td>18</td>
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</tbody>
</table>

Teaching Language: English
Excellent Teaching and Practice Facilities

Teaching Infrastructure

Practical Platform

Orbital Model of BDS Constellation

Antenna

BDS Signal Sampler

BDS Signal Process

Practical Courses and Textbooks

Software for Practical Course

Textbook for Practical Course

Practice Base

The BeiDou/GNSS experimental platform has been built up since 2012. It include four series (17 experiments).
International Exchanges and Cooperation

Indonesia  Singapore  Egypt  Mongolia  Malaysia  Sudan

Nigeria  Australia  Morocco  Thailand  Laos  Uzbekistan

ASEAN(Thailand)  League of Arab States(Egypt)  League of Arab States(Tunis)
The UN Regional Centre in China
In 2014, a new UN Regional Centre was established in China, namely Regional Centre for Space Science and Technology Education in Asia and the Pacific (China) in short RCSSTEAP.

BeiDou/GNSS education and training Program is one major part of RCSSTEAP

an education and training entity supported by UN-COPUOS
Annual Work Plan — 5 Actions

1. Construct personnel and system to facilitate the sustainable development of the Centre

2. Conduct education and training programmes to serve the Centre member countries and other developing countries.

3. Capacity building of the Centre for Space Application Programme

4. Organize activities for promoting visibility of the Centre

5. Publications
So far, the Centre has trained **334** MASTA&DOCSTA participants for **27** developing countries and organized more than **20** short training programmes with over **1000** participants from more than **70** countries.
Short-term Training Programmes

The first Summer Camp of the APSCO Student Small Satellite Project, **Beijing**, August, 2017

**Short Training in Satellite Technology CRASTE-LF**
**Morocco**, October, 2018

**GNSS and BeiDou System Deep Understanding Training**
**Tunisia**, April, 2018

**Training on Space Cooperation for Global Health, China**, April, 2018

International Training Course on “Space-based technologies for disaster risk assessment”
**China**, September, 2019

A series of lectures on Space Technology Applications
**Online**, May-June, 2020
73 countries among the 6 Regional Centres
BDS/GNSS Teaching and Practical Courses
Theoretical Teaching and Practical System

- **In-class experiment**
  On the basis of the current hardware experimental equipment and supporting models in this course, by improving and expanding the “BDS/GNSS satellite orbit design”, “BDS/GNSS satellite signal design”, “BDS/GNSS satellite signal processing” and “BDS/GNSS satellite navigation application” four typical virtual simulation experiments of BDS/GNSS.

- **Future virtual simulation experiment**
  Improve the visualization effect of experimental content, and closely combine virtual simulation experiments with theoretical teaching, teaching models and hardware experiments.

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### Theoretical Course (32 class hours)
- Introduction to PNT
- Principles of PNT
- Spatiotemporal Sys.
- ABAS
- GBAS
- SBAS
- Typical App.
- In- & Out-door App.

### Virtual Simulation Experiment
- Orbital Design
- Signal Design
- Signal Process
- GNSS App

### Practice Course (32 class hours)
- System Integration
- Terminal Monitoring
- Terminal Management
- Joint Test of BeiDou/GNSS App.
Teaching and Practical Courses

- **Wide coverage of students**: Sharing for domestic students among 7 universities in Beijing and for international students among 12 countries
- **Application and practice**: 32 hours theory class to understand the principle + 32 hours practice class for out-door test
- **Real environment test**: Build the application environment of the BeiDou/GNSS system

**Indoor & Outdoor satellite navigation and positioning experiment**

**Students’ feedback**

This course let me know a lot about the frontier of navigation science and technology and the status quo of the country in this field. Every time after learning theoretical courses and doing experiments, I feel a lot of harvest and a sense of accomplishment. ——Student L

The teacher of theory course explained the development process and industrial application of Beidou in a simple and profound way. The content of the experimental course was very interesting, and I didn’t feel enough. ——Student W
Virtual Simulation Platform

- Improve the **visualization effect** of the existing satellite navigation experimental interface.

- Improve the **connection** between theoretical courses and hardware practice courses, and improve the teaching effect of the course.

**Sharing MOOC and virtual simulation experiment platform among members**
RCSSTEAP MASTA/DOCSTA Programme
RCSSTEAP MASTA/DOCSTA Programme

Accepted applicants study at Beihang University /Center in last 5 years

<table>
<thead>
<tr>
<th>Year</th>
<th>BeiDou /GNSS</th>
<th>RSGIS</th>
<th>Small Satellite Technology</th>
<th>Space Law/Policy</th>
<th>Space Science and Environment</th>
<th>Space Technology Application</th>
<th>Total</th>
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<tbody>
<tr>
<td></td>
<td>Master’s Programme</td>
<td>Doctoral Programme</td>
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<td></td>
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<tr>
<td>2018</td>
<td>6</td>
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<td>17</td>
<td>12</td>
<td>/</td>
<td>11</td>
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<td>2019</td>
<td>12</td>
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<td>11</td>
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<td>10</td>
<td>48</td>
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<td>2020</td>
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<td>9</td>
<td>12</td>
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<td>6</td>
<td>8</td>
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<td>9</td>
<td>34</td>
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<td>2022</td>
<td>1</td>
<td>5</td>
<td>11</td>
<td>/</td>
<td>/</td>
<td>9</td>
<td>15</td>
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2023 Programmes will include GNSS, RSGIS, etc. The Announcement will be released in http://rcssteap.buaa.edu.cn

Online Application Time:  
Jan.1, - May 31, 2023

Major Procedures

- All applicants recommended by our member states or cooperation partners
- Material Review
- Online Interview
- Selected and approved by expert team according to participants' overall performance