

Course/module description (*Reference Systems in Geodesy - Системы координат в геодезии*)

Course provider (institution): Razzakov Kyrgyz State Technical University (KSTU)

Course title: Reference Systems in Geodesy (D.2.1.)

Target group: PhD Students (620100 – Geodesy and Remote Sensing Direction. Geodesy and Geoinformation Technologies Program)

Type (compulsory/optional): Compulsory

Number of ECTS credits allocated (if applicable); estimated workload:
10 ECTS (300 academic hours)

Mode of delivery (face-to-face/ distance learning etc.); number of contact hours:
90 class hours (45 - lectures, 45 – labs) and 210 hours for the self study

Language of instruction: Kyrgyz/Russian/ English

Prerequisites and co-requisites (if applicable): Fundamentals of Geodesy/Engineering Geodesy, knowledge of English for reading literature and communication

Course aims:

Introducing students to geodetic computations on the sphere, ellipsoid and map projection planes, definition of geodetic reference systems and transformations among different systems.

Learning outcomes:

After taking this course, the students should (be able to do):

1. understand of principles of geodetic science
2. be able to perform advanced computations on the surface of reference ellipsoid
3. have excellent understanding of different types of map projections and be able to compute map projection coordinates
4. be familiar with concepts of time and celestial coordinates
5. be aware of astro-geodynamic phenomena which affect definition of reference systems such as earth rotation, global tectonics, earth tide etc
6. have deep insight on celestial and terrestrial reference systems including ICRF, ITRF, WGS84, KYRG-06 and PZ-90
7. have good understanding of triangulation-based coordinate systems and different height systems
8. be able to investigate differences among different reference systems and have ability to make transformations

Course content:

1. Introduction. History of geodetic science
2. Spherical trigonometry; Geometry of ellipsoid
3. Geodetic coordinates
4. Geodetic lines
5. General projection theory. Classification of map projections.
6. Azimuthal projections. Conical projections
7. Cylindrical projections. UTM.
8. Celestial coordinates
9. Concept of time. Principles of astronomical positioning.

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10. Earth rotation. Earth Orientation Parameters (EOP). 11. Geodynamics: global tectonics, crustal motion, earth tide/permanent tidal effects 12. Celestial vs terrestrial reference systems. Transformation from ICRF to ITRF. WGS84. UTM. Kyrg-06 13. Astrogeodetic triangulation. Pulkova-42 14. Gravity, geoid and height systems 15. Transformation between triangulation-based coordinate systems and 3D coordinate systems
Recommended or required reading and other learning resources/tools: <ul style="list-style-type: none"> - Course teaching materials available through the university ELMS; - Instant messaging, blog and personal electronic communication platforms; Required literature: <ol style="list-style-type: none"> 1. Метод и системы координат в геодезии. Н.А. Телеганов, Г.Н. Тетерин. Учеб. Пособие. Новосибирск: СГГА, 2008. 143 с. 2. Системы координат в геодезии. В. Л. Клепко, А. В. Александров. Научная монография, Екатеринбург 2011, 116 с. 3. Высшая геодезия. Учебник / Б. Т. Мазуров. Новосибирск: СГУГиТ, 2016. 203 с. 4. Map Projections. Erik W. Grafarend, Friedrich W. Krumm. Springer-Verlag Berlin Heidelberg 2006, 713 p. Additional literature: <ol style="list-style-type: none"> 1. Высшая геодезия и основы координатно-временных систем: Контрольная работа № 1. Л.В. Огородова, Москва, 2017, 37 с. 2. Understanding Map Projections. Melita Kennedy. ESRI 2000, 112 p. 3. Map Projections: A Working Manual. John P Snyder. US GS, 1987, 394 с.
Planned learning activities and teaching methods: <ol style="list-style-type: none"> 1. Lectures and seminars; 2. Laboratory work and computing tasks; 3. Individual project work; 4. Class discussions.
Assessment methods and criteria: <ol style="list-style-type: none"> 1. Lab assignments and computing tasks (25%) 2. Participation in class activity (5) 3. Individual project (30%) 4. Final exam 40%
Grading system: Five-point academic grading system, where 5 - "Excellent" and 2 - "Unsatisfactory" (A, B, C, F)
Additional information: Course instructor – Dr. Akylbek Chymyrov. Contacts: chymyrov@kstu.kg , tel.: +996-552-622916

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