COURSE DESCRIPTION CARD - SYLLABUS

Course name
Satellite navigation systems [S2EiT1E-TIT>SSN]

Course

Field of study
Electronics and Telecommunications

Year/Semester
1/1

Area of study (specialization)
Information and Communication Technologies

Profile of study
general academic

Level of study
second-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

prof. dr hab. inż. Andrzej Dobrogowski

Lecturers

Prerequisites

Student has a systematic knowledge of mathematical analysis, algebra, theory of probability, physics, and the theory of EM field, EM waves propagation, and of construction and properties of antennae. He has a detailed, systematic knowledge of the fundamentals of circuit theory and signal theory. Student knows the principle of operation of digital transmission systems. He Has a detailed, systematic knowledge, of the fundamentals of the telecommunication theory

Course objective

Recognition and understanding of the principles of operation of the satellite navigation systems and their augmentation systems.

Course-related learning outcomes

Knowledge:
Student after passing this course:
1. has a systematic knowledge, with necessary mathematical background, of satellite navigation systems;
2. understands basic concepts of global navigation satellite systems. Is able to justify practical implementation of theese concepts;

3. may motivate the needs that navigation satellite constellation must fullfil;
4. understands the limitation of the satellite navigation systems and the necessity of using completive systems in order to get everywhere available navigation.

Skills:
Student:
1. is able to evaluate the parameters of telecommunication satellite systems; is able to evaluate the parameters which determine the positioning accuracy of a satellite navigation system; is able to measure the parameters of signals and components of satellite navigation systems;
2. is prepared to use technical literature (also technical periodicals);
3. efectively use satellite navigation equipment;
4. is able to make course estimation of the GNSS receivers quality.

Social competences:
Student:
1. stresses the importants of navigation abilities for society;
2. is able to recognize problem which effective solution involve the GNSS.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Knowledge is verified by a written test at the end of the semester. The test contains 3-6 problem questions evaluated using points. Passing threshold: 50% of total points (it may change depending on the difficulty of the questions, how they are scored etc.). Activity and demonstration of knowledge during the lecture allow to get additional points for final assessment.

Programme content

Ubiquitos positioning and navigation. Navigation methods. Basic characteristics of the navigation systems. Time scales - GNSS system time. Coordinate systems and reference frames. Models of the Earth. World geodetic system WGS-84. Kepler"s laws. Equation of satellite motion, satellite orbits. Keplerian elements (parameters). Navigation satellite constellation. Orbital ephemerides. GNSS signals and modulation schemes. navigation message and its content. Navigation equations and their solving methods. GNSS user"s velocity determination. Relativistic effects. GNSS navigation performance. PVT services. Architecture of GNSS receivers. GPS, GLONASS, Galileo and Compass. Differential and augmentation systems: DGPS, WASS, EGNOS, SBAS, GBAS, and ABAS.

Course topics

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Teaching methods

Lecture: multimedia presentations illustrated with examples and mathematical or graphic descriptions presented on the board.

Bibliography

Basic:
1. P. Misra, P. Enge, Global Positioning System. Signals, Measurements, and Performance, Revised Second Edition, Ganga-Jamuna Press, 2011
2. B. Hofmann-Wellenhof, H. Lichtenegger, E. Wasle, GNSS ? Global Navigation Satellite Systems GPS, GLONASS, Galileo and more, Springer Wien New York 2008

3. E. D. Kaplan, Ch. J. Heagarty, Editors, Understanding GPS. Principles and Applications, Second Edition, Artech House 2006

Additional:
1. S. Gleason, D. Gebre-Egziabher (editors), GNSS Aplications and Methods, Artech House, Boston London 2009
2. R. Prasad, M. Ruggieri, Applied Satellite Navigation Using GPS, GALILEO, and Augmentation Systems, Artech House, Boston London 2005

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	40	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	10	0,00