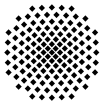

Universität Stuttgart

Modulhandbuch

Studiengang Master of Science Geomatics Engineering

Prüfungsordnung: 2008

Sommersemester 2012
Stand: 25. April 2012

Universität Stuttgart
Keplerstr. 7
70174 Stuttgart

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Inhaltsverzeichnis

Präambel

Geoinformationen und Positionsbestimmung als Basis für die unterschiedlichsten Planungs- und Entscheidungsprozesse sind heute von grundlegender Bedeutung für die nachhaltige Entwicklung und den schonenden Umgang mit den Ressourcen, zum Beispiel im Verkehrsbereich. In vielen Entwicklungs- und Schwellenländern fehlt die dafür notwendige landesweite Geodaten-Infrastruktur und die Kenntnisse im Bereich Positionsbestimmung. Deshalb setzt sich der Masterstudiengang GEOENGINE das Ziel, den Studierenden die der Erfassung, Verwaltung, Verarbeitung und Interpretation von Geodaten zugrunde liegenden Theorien und Modellbildungen zu vermitteln. Die Vermittlung reinen Faktenwissens soll in den Hintergrund treten. Die Studierenden werden befähigt, auf der Basis eines adäquaten theoretischen Fundaments sich selbstständig in die sich rasch wandelnden Anforderungen der benutzten Hard- und Softwaresysteme einzuarbeiten. Der Studiengang befähigt somit die Absolventen zu erfolgreicher Tätigkeit während des gesamten Berufslebens.
In den Entwicklungs- und Schwellenländern ist eine Ausbildung in den Gebieten Geodäsie und Geoinformatik überwiegend auf dem Niveau eines Bachelorabschlusses anzutreffen, vielfach nur als optionale Vertiefungsrichtung im Rahmen von anderen Programmen, wie z.B. als Teil des Bauingenieurwesens. Die betreffenden Studiengänge vermitteln im Allgemeinen kein vertieftes Verständnis für die Theorien und komplexen Modellbildungen in Geodäsie und Geoinformatik, wie sie beispielsweise für die Erdbeobachtung und -messung notwendig sind.

Qualifikationsziele

Geoinformationen und Positionsbestimmung als Basis für die unterschiedlichsten Planungs- und Entscheidungsprozesse sind heute von grundlegender Bedeutung für die nachhaltige Entwicklung und den schonenden Umgang mit den Ressourcen, zum Beispiel im Verkehrsbereich. In vielen Entwicklungs- und Schwellenländern fehlt die dafür notwendige landesweite Geodaten-Infrastruktur und die Kenntnisse im Bereich Positionsbestimmung. Deshalb setzt sich der Masterstudiengang GEOENGINE das Ziel, den Studierenden die der Erfassung, Verwaltung, Verarbeitung und Interpretation von Geodaten zugrunde liegenden Theorien und Modellbildungen zu vermitteln. Die Vermittlung reinen Faktenwissens soll in den Hintergrund treten. Die Studierenden werden befähigt, auf der Basis eines adäquaten theoretischen Fundaments sich selbstständig in die sich rasch wandelnden Anforderungen der benutzten Hard- und Softwaresysteme einzuarbeiten. Der Studiengang befähigt somit die Absolventen zu erfolgreicher Tätigkeit während des gesamten Berufslebens.
In den Entwicklungs- und Schwellenländern ist eine Ausbildung in den Gebieten Geodäsie und Geoinformatik überwiegend auf dem Niveau eines Bachelorabschlusses anzutreffen, vielfach nur als optionale Vertiefungsrichtung im Rahmen von anderen Programmen, wie z.B. als Teil des Bauingenieurwesens. Die betreffenden Studiengänge vermitteln im Allgemeinen kein vertieftes Verständnis für die Theorien und komplexen Modellbildungen in Geodäsie und Geoinformatik, wie sie beispielsweise für die Erdbeobachtung und -messung notwendig sind.
Der Masterstudiengang GEOENGINE soll künftigen Fachleuten die Problemlösungskompetenz und das notwendige Wissen vermitteln, um im Bereich Geodäsie und Geoinformatik in ihren Heimatländern sowohl theoretisch als auch praxisrelevant zu arbeiten. Absolventen des MSc- Studiengangs GEOENGINE:
• sind in der Lage, die Grundlagen für die Schaffung einer Geodaten-Infrastruktur zu legen;
• haben vertiefte Kenntnisse über den derzeitigen Stand der Technologie, insbesondere in den Bereichen Positionsbestimmung, Navigation und Erdbeobachtung;
• sind durch die Auseinandersetzung mit den methodischen Grundlagen für die Erfassung, Verwaltung, Verarbeitung und Interpretation von Geodaten zu einer erfolgreichen Tätigkeit während ihres Berufslebens befähigt, auch und gerade in einem Umfeld, das sich dynamisch entwickelt;
• verfügen über die Kompetenzen, die Technologie an die Bedürfnisse ihrer jeweiligen Volkswirtschaften zu adaptieren;
• können die Ergebnisse ihrer Arbeit unter Zuhilfenahme moderner Medien einprägsam präsentieren;
• besitzen die wissenschaftliche Qualifikation für eine Promotion.

100 Module

Zugeordnete Module:

41210 Advanced Mathematics
41220 Geomatics Methodology
41230 Geodesy
41240 Data Acquisition
41250 Representation of Geodata
41260 Language and Culture
41270 Law
41280 Integrated Fieldwork
41290 Positioning and Navigation
41300 Geo-Telematics

Modul: 41210 Advanced Mathematics

2. Modulkürzel:	95/936/01	5. Moduldauer:	1 Semester
3. Leistungspunkte:	5.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	5.0	7. Sprache:	Englisch

8. Modulverantwortlicher:	Wolfgang Keller
9. Dozenten:	• Wolfgang Keller • Matthias Weigelt
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Geomatics Engineering → Module
11. Empfohlene Voraussetzungen:	Skills in Calculus to an extend, which is usually provided by an undergraduate mathematics course
12. Lernziele:	The module aims at establishing a common level of math skills for all students, smoothing out their individual entry levels. The module will provide secure skills in calculus, potential theory, theory of differential equations and Fourier analysis for later use in the other modules of the GEOENGINE curriculum.
13. Inhalt:	• Vector analysis • Integral theorems • Special functions • Ordinary and partial differential equations • Potential theory
14. Literatur:	Kreyszig, E. (1999, 2006): Advanced Engineering Mathematics, Wiley & Sons
15. Lehrveranstaltungen und -formen:	• 412101 Lecture Advanced Mathematics • 412102 Lab Advanced Mathematics
16. Abschätzung Arbeitsaufwand:	Classical lectures, supported by exercises. Exercises are given as homework and the solutions have to be presented in seminar form. The presentations will be assessed. Additional tutorials are offered to those students, who need a stronger support. A mid-term written test is compulsory. The students are provided a collection of exercises with solutions for self-study. • written examination, 90 minutes (open book) • assessment of presentation of exercises solutions • mid-term test
17. Prüfungsnummer/n und -name:	41211 Advanced Mathematics (PL), schriftliche Prüfung, 90 Min., Gewichtung: 3.0, written examination, 90 minutes (open book) 9(12)assessment of presentation of exercises solutions 2(12)mid-term test 1(12)
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	Geodätisches Institut

Modul: 41240 Data Acquisition

2. Modulkürzel:	95/936/04	5. Moduldauer:	2 Semester
3. Leistungspunkte:	9.0 LP	6. Turnus:	jedes 2. Semester, SoSe
4. SWS:	8.0	7. Sprache:	Englisch

8. Modulverantwortlicher:	Alfred Kleusberg
9. Dozenten:	• Volker Schwieger • Rainer Schützle • Dieter Fritsch • Michael Cramer • Alfred Kleusberg • René Pasternak
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Geomatics Engineering → Module
11. Empfohlene Voraussetzungen:	knowledge of Advanced Mathematics (Module 1) and Geomatics Methodology (Module 2) is required for module sections Airborne Data Acquisition and Remote Sensing.
12. Lernziele:	The objective of this module is to provide the student with a thorough understanding of methods and modern instrumentation for the acquisition of spatial data using terrestrial, airborne and space-borne platforms. Based on the information provided in this module, the students will be in a position for a specific task of data acquisition at hand to evaluate the various options for the acquisition of these data. They will be able to select either terrestrial, airborne or space-borne methods, or an appropriate mixture of these. For each of these methods they will have an understanding of the parameters governing the temporal and spatial resolution, the spatial and temporal sampling, the accuracy and the availability of the data.
13. Inhalt:	• Terrestrial data acquisition with multisensor systems • Analogue and digital data registration, bus-based systems • Synchronisation, Real-time data processing • Graphical programming of data acquisition systems • Analogue and digital imagery Image processing (interior and exterior orientation, aerotriangulation, orthophoto generation) • Operation of digital photogrammetric work stations • Non-optical airborne sensors (Laser scanner, Radarsystems) • 3D digital elevation models, virtual city models • Physical foundations of satellite remote sensing systems • Emission, transmission, absorption and reflection of radiation • Capture and measurement of radiation data in sensor systems • Transmission, storage and presentation of remote sensing data • Modern satellite based remote sensing systems
14. Literatur:	Padmanabhan, R.T. (2000). Industrial Instrumentation - Principles and Design. Springer. Webster, G.J. (1999). Measurement, Instrumentation and Sensors - The Handbook. Springer. Weichert, N. and Wülker, M. (2000).Messtechnik und Messdatenerfassung. Oldenbourg.

	Mikhail, E.M., Bethel, J.S. , McGlone, J.C. (2001): Introduction to Modern Photogrammetry. John Wiley & Sons, New York, 479 p. Schenk, T. (1999): Digital Photogrammetry. Vol. I, TerraScience, Laurelville, 428 p. Fritsch, D. (03,05,07): Photogrammetric Week'0X. Wichmann Verlag, Heidelberg.
15. Lehrveranstaltungen und -formen:	• 412401 Lecture Terrestrial Multisensor Data Acquisition • 412402 Lab Terrestrial Multisensor Data Acquisition • 412403 Lecture Airborne Data Acquisition • 412404 Lab Airborne Data Acquisition • 412405 Lecture Remote Sensing • 412406 Lab Remote Sensing
16. Abschätzung Arbeitsaufwand:	To a large extent classical lectures, supported by lab exercises. Labs are comprised of programming, data processing, analysis and technical communication of results. The module section Terrestrial Data Acquisition includes an integrated project for the acquisition, processing and analysis of a multi-sensor system. Results of lab exercises are presented in written form and orally, in regularly scheduled seminars.
17. Prüfungsnummer/n und -name:	41241 Data Acquisition (PL), schriftliche Prüfung, 180 Min., Gewichtung: 3.0, written examination, 60+120 minutes (closed book) 9(12),term work Terrestrial Multisensor Data Acquisition 1(12),term work Airborne Data Acquisition 1(12),term work Remote Sensing 1(12)
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	Institut für Ingenieurgeodäsie Stuttgart

Modul: 41300 Geo-Telematics

2. Modulkürzel:	95/936/10	5. Moduldauer:	1 Semester
3. Leistungspunkte:	10.0 LP	6. Turnus:	jedes 2. Semester, SoSe
4. SWS:	9.0	7. Sprache:	Englisch

8. Modulverantwortlicher:	Univ.-Prof.Dr.-Ing. Volker Schwieger
9. Dozenten:	• Dieter Fritsch • Susanne Becker • Martin Metzner • Rainer Schützle • Volker Schwieger • Alexander Beetz
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Geomatics Engineering → Module
11. Empfohlene Voraussetzungen:	Advanced Mathematic (Module 1), Geomatics Methodology (Module 2) and Data Acquisition (Module 4).
12. Lernziele:	The students will be able to analyse the interaction of telematics, positioning and guidance for moving objects. They will learn to realize algorithms for navigation, guidance and optimization as well as to observe, model and position moving objects. The section Topology and Optimization deals with the regarding to topology and guidance as well as the respective optimization algorithms. The section Transport Telematics provides knowledge about the interaction of information sources for applications within the transportation sector. The section Kinematic Measurements and Positioning deals with the observation, modelling, positioning and controlling of moving objects.
13. Inhalt:	• Open, closed and interrelated sets, open kernel and closed hull • Topological gender, graph theory, guidance algorithms • Linear and non-linear optimization • Branch- and Bound algorithm, travelling salesman problem • Digital road network • Communication technologies • Positioning and navigation systems • Traffic management systems, computer assisted operational control systems Information services for traffic, driver assistance systems • Data acquisition and modelling of moving objects • Robot tachymeters, kinematic sensors • Positioning for moving objects, Kalman filter and further filter algorithms • Integration of kinematic measurements into control circles
14. Literatur:	Meissl, P. (1982): Least Squares Adjustment - A Modern Approach.Mitteilungen der geodätischen Institute der technischen Universität Graz, Folge 43 Koch, K.R. (1997): Parameter Estimation and Hyphotesis Testing in linear Models. Springer, Berlin, 333p. Grafarend, E.W., Sanso, F. (Ed.) (1985): Optimization and Design of Geodetic Networks. Springer, Berlin, 606p. McQueen, B. und McQueen, J. (1999): Intelligent transportation systems architectures. Boston: Artech House.

Drane, C. und Rizos, C. (1998): Positioning systems in intelligent transportation systems. Boston: Artech House.

Anand, D.K.: Introduction to control systems (1974). Pergamon, New York Braunschweig.

Gelb, G. (1994, Editor): Applied optimal estimation (Reprint 13). M.I.T. Press, Cambridge, Mass., USA.

Chui, C.K., Chen, G. (1999): Kalman filtering with real time applications (3rd edition). Springer, Heidelberg - Berlin.

Deumlich, F., Staiger, R. (2002): Instrumentenkunde der Vermessungstechnik (9. Auflage). Wichmann, Heidelberg.

Anand, D.K.: Introduction to control systems (1974). Pergamon, New York Braunschweig.

15. Lehrveranstaltungen und -formen:	• 413001 Lecture Topology and Optimization • 413002 Lab Topology and Optimization • 413003 Lecture Transport Telematics • 413004 Lab Transport Telematics • 413005 Lecture Kinematic Measurements and Positioning • 413006 Lab Kinematic Measurements and Positioning
16. Abschätzung Arbeitsaufwand:	Classical lectures supported by practical exercises. Additional home exercises are performed to deepen the theoretical knowledge. A part of the practical and the home exercises will be carried through in autonomous working groups.
17. Prüfungsnummer/n und -name:	41301 Geo-Telematics (PL), schriftliche Prüfung, 180 Min., Gewichtung: 3.0, written examination, 180 minutes (closed book) 9(12)term work Topology and Optimization 1(12)term work Transport Telematics 1(12)term work Kinematic Measurements and Positioning 1(12)
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	Institut für Photogrammetrie

Modul: 41230 Geodesy

2. Modulkürzel:	95/936/03	5. Moduldauer:	2 Semester
3. Leistungspunkte:	9.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	9.0	7. Sprache:	Deutsch

8. Modulverantwortlicher:	Nico Sneeuw
9. Dozenten:	• Wolfgang Keller • Nico Sneeuw • Tilo Reubelt • Friedrich Wilhelm Krumm • Matthias Roth
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Geomatics Engineering → Module
11. Empfohlene Voraussetzungen:	Knowledge of Advanced Mathematics (Module 1) is required for module sections Physical Geodesy and Map Projections & Coordinate Systems.
12. Lernziele:	This module provides the student with profound knowledge of classical and modern geodetic concepts. Through the individual module sections the student will appreciate the fundamental role of coordinate systems and coordinate frames in geomatics engineering. The Satellite Geodesy module section enables the student to independently judge and apply satellite geodetic techniques for coordinate acquisition with sound knowledge of wave propagation and error modelling. From the Physical Geodesy module section, the student will appreciate the role of the Earth's gravity field as a natural reference system and will learn about spherical and ellipsoidal approximations. The module section on Map Projections and Geodetic Coordinate Systems provides critical skills and tools to represent and map the Earth, and to perform datum transformations.
13. Inhalt:	• Global vs. local, inertial vs. Earth-fixed coordinate systems, coordinate transformations, datum transformations • Conventional reference systems and frames, time systems • Signal propagation • Orbital mechanics • Potential theory, gravitation, boundary value problems • Gravimetry, height systems, geodynamics • Differential geometry, representation of surface metrics, Cauchy-Riemann deformation tensor • Map projections (conformal, equal-area and optimal, GK, UTM)
14. Literatur:	G. Seeber (1993), Satellite Geodesy, de Gruyter B. Hofmann-Wellenhof, H. Lichtenegger and J. Collins (1997), GPS - Theory and Practice, Springer B. Hofmann-Wellenhof, H. Moritz (2005): Physical Geodesy, Springer Verlag W. Torge (2001): Geodesy, de Gruyter Bugayevskiy L M and J P Snyder (1995): Map Projections - A Reference Manual. Taylor & Francis

Canters F and H Decleir (1989): The world in perspective: A directory of world map projections. Wiley

Grafarend E W and F W Krumm (2007): Map Projections, Cartographic Information Systems. Springer

Heck B (2003): Computational Techniques and Models of Mathematical Geodesy. Classical and Modern Methods. 3rd, Updated and Enlarged Edition. Wichmann Heidelberg (In German)

Hooijberg M (2008): Geometrical Geodesy Using Information and Computer Technology, Springer

Iliffe J (2000): Datums and Map Projections for Remote Sensing, GIS, and Surveying. Boca Raton

Kühnel W (2002): Differential Geometry. Curves - Surfaces - Manifolds. Student Mathematical Library, Vol. 16, American Mathematical Society

Lauf GB (1983): Geodesy and Map Projections. TAFE Publications Unit, Collingwood, Vic.

Maling D H (1992): Coordinate Systems and Map Projections. 2nd Edition, Oxford

McDonnel PW (1991): Introduction to Map Projections. 2nd Edition. Permission department, Landmark Enterprises, Rancho Cordova, Ca, USA

Pearson F (1990): Map Projection: Theory and Applications. Boca Raton

Snyder J.P. (1987): Map Projections - A Working Manual. USGS Professional Paper 1395, United States Government Printing Office, Washington

15. Lehrveranstaltungen und -formen:	• 412301 Lecture Satellite Geodesy • 412302 Lab Satellite Geodesy • 412303 Lecture Physical Geodesy • 412304 Lab Physical Geodesy • 412305 Lecture Map Projections & Geodetic Coordinate Systems • 412306 Lab Map Projections & Geodetic Coordinate Systems
16. Abschätzung Arbeitsaufwand:	To a large extent classical lectures, supported by lab exercises. Labs, some of which will be conducted in small groups, consist of programming (Matlab), data processing, analysis and technical communication of results. The technical communication component is mostly in written form. However, all students will have to present their work several times in seminars. The e-learning component and available Q&A catalogues allow the students to assess their knowledge independently.
17. Prüfungsnummer/n und -name:	41231 Geodesy (PL), schriftliche Prüfung, 180 Min., Gewichtung: 3.0, written examination, 180 minutes (closed book) 9(12)term work Satellite Geodesy 1(12)term work Physical Geodesy 1(12)term work Map Projections and Geodetic Coordinate Systems 1(12)
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	Geodätisches Institut

Modul: 41220 Geomatics Methodology

2. Modulkürzel:	95/936/02	5. Moduldauer:	1 Semester
3. Leistungspunkte:	10.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	9.0	7. Sprache:	Englisch

8. Modulverantwortlicher:	Dieter Fritsch
9. Dozenten:	• Friedrich Wilhelm Krumm • Matthias Roth • Alfred Kleusberg • Hendy Fitrian Suhandri • Dieter Fritsch • Mathias Rothermel
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Geomatics Engineering → Module
11. Empfohlene Voraussetzungen:	Elementary knowledge of mathematics and statistical inference is expected from prior BSc programs.
12. Lernziele:	This module conveys advanced skills in statistical analysis and optimal processing of geodetic observations. From the different module sections the student will gain deeper knowledge and experience in the mathematical concepts of static and dynamic modelling approaches. This enables the student to solve for a wide range of problems in the field of network adjustments, Kalman filtering and digital image processing. The main focus of the module section Statistical Inference is to qualify students to independently decide on and to implement the appropriate adjustment model dependent on the type of application. Besides the standard adjustment approaches special focus is laid on advanced models and kinematic applications, which directly leads to the second module section. The Dynamic System Estimation part will concentrate on the dynamic modelling only. Through this module section the student will appreciate the role of dynamic system modelling and is enabled to formulate state space vectors adopted for specific applications. The processing of time discrete signals as they are provided from the various geodetic sensors plays a fundamental role within the overall measurement process. Within the module section Signal Processing the student will get an in-depth knowledge of filter analysis and will understand the design of signal processing systems based on statistical approaches and estimation processes.
13. Inhalt:	• Foundations of linear algebra and parameter estimation • Least squares model, Gauß-Markoff model with/without restrictions, mixed model, prediction and collocation • Linear/linearized dynamic models • Discrete signals, discrete convolution, discrete Fourier transform, fast Fourier transform • Stochastic processes and error models • Optimal filters, recursive filter, smoothing technologies, Kalman filtering • Two dimensional signal processing, signal representation, 2D filters
14. Literatur:	Beucher O (2007): Wahrscheinlichkeitsrechnung und Statistik mit MATLAB. Springer, ISBN 978-3-540-72155-0

Caspary W and K Wichmann (2007): Auswertung von Messdaten. Statistische Methoden für Geo- und Ingenieurwissenschaften. Oldenbourg, ISBN 978-3-486-58351-9

Chatterjee, Samprit and Ali S. Hadi (2006): Regresson Analysis by Example. 4th edition. John Wiley & Sons, Inc., ISBN 13 978-0-471-74696-6

Grafarend E W (2006): Linear and Nonlinear Models - Fixed Effects, Random Effects, and Mixed Models. de Gruyter, ISBN 978-3-11-016216-5

Koch K R (1999): Parameter Estimation and Hypothesis Testing in Linear Models. 2nd updated and enlarged edition. Springer, ISBN 978-3-540-65257-1

Koch K R (1997): Parameterschätzung und Hypothesentests in linearen Modellen. Dritte, bearbeitete Auflage. Dümmlers, ISBN 3-427-78923-3

Lay D C (2003): Linear Algebra and its Applications. 3rd edition. Addision-Wesley Publishing Company, ISBN 0-201-70970-8

Magnus J R and H Neudecker (1988): Matrix Differential Calculus with Applications in Statistics and Ecnonometrics. John Wiley & Sons Ltd., ISBN 0-471-91516-5

Mikhail E M and F Ackermann (1976): Observations and Least Squares. IEP-A Dun-Donnelley Publisher, ISBN 0-7002-2481-5

Niemeier, W (2008): Ausgleichungsrechnung, statistische Auswertemethoden. 2. überarbeitete und erweiterte Auflage. de Gruyter, ISBN 978-3-11-019055-7

Strang G (2005): Linear Algebra and its Applications. 3rd edition. Harcourt Brace & Company, ISBN 0030105676

Strang G (2009): Introduction to Linear Algebra. 4th edition. Wellesley-Cambridge Press, ISBN 078-0-9802327-1-4

Strang G and K Borre (1997): Linear Algebra, Geodesy, and GPS. Wellesley-Cambridge Press, ISBN 0-9614088-6-3

Teunissen P J G (2003): Adjustment theory - an introduction. Delft University Press, ISBN 13 978-90-407-1974-5

Teunissen P J G (2006): Testing theory - an introduction. Delft University Press, ISBN 13 978-90-407-1975-2

Teunissen P J G (2001): Dynamic data processing - recursive least-squares. Delft University Press, ISBN 13 978-90-407-1976-9

The MathWorks Inc. (1999): Signal Processing Toolbox. http://www.mathworks.com

15. Lehrveranstaltungen und -formen:	• 412201 Lecture Statistical Inference • 412202 Lab Statistical Inference • 412203 Lecture Dynamic System Estimation • 412204 Lab Dynamic System Estimation • 412205 Lecture Signal Processing • 412206 Lab Signal Processing

16. Abschätzung Arbeitsaufwand:	Classical lectures supported by multi-medial e-learning sections for self study. The theoretical part of the module is accompanied by lab exercises, including practical application of theory. The technical communication component is mostly in written form.
17. Prüfungsnummer/n und -name:	41221 Geomatics Methodology (PL), schriftliche Prüfung, 180 Min., Gewichtung: 3.0, written examination, 180 minutes (closed book) 9(12)term work Statistical Inference 1(12)term work Dynamic System Estimation 1(12)term work Signal Processing 1(12)
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	Geodätisches Institut

Modul: 41280 Integrated Fieldwork

2. Modulkürzel:	95/936/08	5. Moduldauer:	1 Semester
3. Leistungspunkte:	5.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	0.0	7. Sprache:	Englisch

8. Modulverantwortlicher:	Univ.-Prof.Dr.-Ing. Volker Schwieger
9. Dozenten:	• Volker Schwieger • Dieter Fritsch • Wolfgang Keller • Alfred Kleusberg • Nico Sneeuw
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Geomatics Engineering → Module
11. Empfohlene Voraussetzungen:	Advanced Mathematics (Module 1), Geomatics Methodology (Module 2), Geodesy (Module 3), Data Acquisition (Module 4) and Representation of Geodata (Module 5).
12. Lernziele:	This module is the synthesis of all knowledge acquired in previous modules. It enables students to analyse real-life Geomatics Engineering tasks and to solve those tasks and problems with an engineering approaching an autonomous way. Through carefully designed project planning students will simultaneously develop project management and team work skills.
13. Inhalt:	Varying topics will be dealt with; examples of the past project are "geoid determination", "development of a tourist information system" and "setting out of a tunnel".
14. Literatur:	
15. Lehrveranstaltungen und -formen:	412801 Lecture/Lab Integrated Fieldwork
16. Abschätzung Arbeitsaufwand:	The students work in a team for ten days to realize a project on a special topic. The individual measurement, evaluation and analysis tasks will be carried through in small working groups. The lecturers supervise the work and guide the students to solve occurring problems. Before the fieldwork the students have to prepare their part of the common project. This task comprises the presentation of a work package as well as a task description for the colleagues. After the fieldwork the students have to prepare a final report and to present the results of their work package.
17. Prüfungsnummer/n und -name:	41281 Integrated Fieldwork (PL), mündliche Prüfung, 20 Min., Gewichtung: 3.0, oral examination (presentation), 20 minutes 3(10)final written report 4(10)preparation of fieldwork 3(10)
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	Institut für Ingenieurgeodäsie Stuttgart

Modul: 41260 Language and Culture

2. Modulkürzel:	95/936/06	5. Moduldauer:	1 Semester
3. Leistungspunkte:	9.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	0.0	7. Sprache:	Deutsch

8. Modulverantwortlicher:	Dr. Karin Herrmann
9. Dozenten:	N. N.
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Geomatics Engineering → Module
11. Empfohlene Voraussetzungen:	Teaching level according to the results of placement test
12. Lernziele:	The module conveys a basic knowledge about German grammar, vocabulary, regional and cultural studies and it provides basic conversations skills. At the end of the module the students will have acquired the following skills: - Listening comprehension - Reading comprehension - Grammar - Text production. The content of the module is oriented at the European Reference Frame Basic level / level A - B.
13. Inhalt:	• Grammar and vocabulary • Exercises in listening comprehension • Development of strategies for reading of complex texts • Development of competences in daily-life communication • Intercultural problems • Living and working in Germany • Leisure and travelling • Mass media
14. Literatur:	
15. Lehrveranstaltungen und -formen:	• 412601 Lecture Language • 412602 Lab Language
16. Abschätzung Arbeitsaufwand:	
17. Prüfungsnummer/n und -name:	41261 Language and Culture (PL), schriftliche Prüfung, 180 Min., Gewichtung: 3.0, written final examination, 180 minutes 2(3)written mid term test + oral test 1(3)
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	Interkultureller Unterricht

Modul: 41270 Law

2. Modulkürzel:	95/936/07	5. Moduldauer:	1 Semester
3. Leistungspunkte:	3.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	2.0	7. Sprache:	Englisch

8. Modulverantwortlicher:	
9. Dozenten:	
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Geomatics Engineering → Module
11. Empfohlene Voraussetzungen:	none
12. Lernziele:	The module imparts basic features of the contract, media and internet law. The student learns to recognize the separate functions and business processes, their main subjects and their duties and responsibilities. This results in a better understanding of the role and use of information technology in businesses across all functions.
13. Inhalt:	This module provides the students with fundamental knowledge in distinct areas: • Objectives and mechanism of law, the legal system (overview), the system of national law, the European system of law, international law • Contracts: General remarks, requirements for a contract in general, terms of contract, irregularities in the performance of the contract, types of contract, disputes, arbitration, law-suits • The law on torts (liability): general remarks tort liability based on fault, product liability • Selected field of law (overview): Labour law, the law of business associations, competition law, copyright, patent, brands and related rights, data protection, other areas of interest (i.e. new European legislation on e-commerce, ...)
14. Literatur:	
15. Lehrveranstaltungen und -formen:	412701 Lecture Law
16. Abschätzung Arbeitsaufwand:	Classical lectures complemented by case studies for the deeper understanding of the theoretical outlines
17. Prüfungsnummer/n und -name:	41271 Law (PL), schriftliche Prüfung, 90 Min., Gewichtung: 3.0
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	

Modul: 41290 Positioning and Navigation

2. Modulkürzel:	95/936/09	5. Moduldauer:	1 Semester
3. Leistungspunkte:	10.0 LP	6. Turnus:	jedes 2. Semester, SoSe
4. SWS:	8.0	7. Sprache:	Englisch

8. Modulverantwortlicher:	Alfred Kleusberg
9. Dozenten:	• Alfred Kleusberg • Hendy Fitrian Suhandri • Matthias Weigelt
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Geomatics Engineering → Module
11. Empfohlene Voraussetzungen:	Advanced Mathematics (Module 1) and Geomatics Methodology (Module 2)
12. Lernziele:	The objective of this module is to provide a profound knowledge of modern positioning and navigation methods and systems, and the related equipment. The students will be able to select from those systems a particular one, or a combination of systems, to satisfy a given positioning or navigation requirement. They understand the different accuracy levels achievable by utilising these systems based on a particular selection of hardware and processing methodology and software. They understand the tools for combining measurements from sensors of different systems, especially in the case of kinematic positioning and navigation.
13. Inhalt:	• Global Navigation Satellite Systems (GPS, Glonass, Galileo) • GNSS signal structure and signal propagation • GNSS receiver structure and measurement techniques • On-board navigation sensors, Inertial Measurement Units (Strap-Down) • Satellite Laser Ranging, Satellite Altimetry • Satellite-to-Satellite Tracking • Very Long Baseline Interferometry • Sensor fusion, Kalman Filter application in positioning and navigation • Error estimation and control
14. Literatur:	Leick, A. (2004), Satellite Surveying, Wiley & Sons Seeber, G. (2004), Satellite Geodesy, deGruyter
15. Lehrveranstaltungen und -formen:	• 412901 Lecture Satellite Navigation • 412902 Lab Satellite Navigation • 412903 Lecture Integrated Positioning and Navigation • 412904 Lab Integrated Positioning and Navigation • 412905 Lecture Satellite Geodesy Observation Techniques • 412906 Lab Satellite Geodesy Observation Techniques
16. Abschätzung Arbeitsaufwand:	To a large extent classical lectures, supported by lab exercises. Labs include programming exercises and the acquisition and processing of GNSS and IMU data both in real-time and post mission mode. Lab results are prepared in written form and are presented to the class in seminars.
17. Prüfungsnummer/n und -name:	41291 Positioning and Navigation (PL), schriftliche Prüfung, 180 Min., Gewichtung: 3.0, written examination, 180 minutes (closed book) 9(12)term work Satellite Navigation 1(12)term work Integrated Positioning and Navigation 1(12)term work Satellite Geodesy Observation Techniques 1(12)

18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	Institut für Navigation

Modul: 41250 Representation of Geodata

2. Modulkürzel:	95/936/05	5. Moduldauer:	1 Semester
3. Leistungspunkte:	5.0 LP	6. Turnus:	jedes 2. Semester, SoSe
4. SWS:	5.0	7. Sprache:	Englisch

8. Modulverantwortlicher:	Dieter Fritsch
9. Dozenten:	• Dieter Fritsch • Volker Walter • Roland Stützle
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Geomatics Engineering → Module
11. Empfohlene Voraussetzungen:	The module is based on the foundations from Advanced Mathematics (Module 1)
12. Lernziele:	Within this module the students will understand the methods and technologies of spatial data handling, analysis and presentation. The students will be enabled to acquire the relevant geodata for a complex application and to perform the appropriate geometric, topologic and thematic modelling, analysis and presentation. The main focus of the Geoinformatics module section is the acquisition of geodata, its management, analysis and representation. This part will offer students a deeper insight into the technologies of spatial data structures, data representation schemes and methods for data analysis. This knowledge is supplemented by topics covered in the Thematic Cartography module section. This part of the course will convey competence in the basics of cartography and the creation and optimal presentation of thematic data.
13. Inhalt:	• Geodata acquisition (methods, sources, hardware, interaction, meaning of separate data sources) • Data Modelling (geometric, topologic, thematic) and data management (file systems, data base systems, data models) • Access mechanisms for spatial data (hierarchic-static methods, dynamic methods) • Methods for data analysis (geometric analysis, raster analyses, network analyses) • Analysis for information systems requirements (focus on thematic maps) • Scientific cartography, cognitive maps, structure of the geo-data market • Techniques of homogenizing data sets (matching and merging) • Map design, animated maps, thematic maps for individual and public transport
14. Literatur:	D. Ian Heywood, Sarah Cornelius, Steve Carver, Ian Heywood: An Introduction to Geographical Information Systems, 2nd Edition 2002, Prentice Hall. Christopher Jones: Geographical Information Systems and Computer Cartography, Addison Wesley Longman Ltd., Harlow, 1997. Michael Worboys: GIS - A Computing Perspective, Taylor and Francis, 1995. S. Aronoff: Geographic Information Systems: A Management Perspective, WDL Publications, Ottawa, Canada, 1991.

	Kraak, M.-J. / Ormeling, F. J. (2003): Cartography, Visualization of Spatial Data. 2nd Edition. Harlow, Pearson. Taylor, D.R.F (Ed.) 1998): Policy Issues in Modern Cartography, Volume 3 in Modern Cartography Series (ed. and contributor), Oxford, Pergamon.
15. Lehrveranstaltungen und -formen:	• 412501 Lecture Geoinformatics • 412502 Lab Geoinformatics • 412503 Lecture Thematic Cartography • 412504 Lab Thematic Cartography
16. Abschätzung Arbeitsaufwand:	Classical lectures supported by practical exercises. Parts of these exercises are performed as team work in the computer lab, during which a large sample project is realized from data acquisition to data analysis and up to presentation. Additional home exercises are performed to deepen the theoretical knowledge and to assess individual knowledge.
17. Prüfungsnummer/n und -name:	41251 Representation of Geodata (PL), schriftliche Prüfung, 90 Min., Gewichtung: 3.0, written examination, 90 minutes (closed book) 6(8)Term works Geoinformatics 1(8)Term works Thematic Cartography 1(8)
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	Institut für Photogrammetrie

200 Mastermodul

Zugeordnete Module: 80600 Master Thesis GEOENGINE

Modul: 80600 Master Thesis GEOENGINE

2. Modulkürzel:	[pord.modulcode]	5. Moduldauer:	1 Semester
3. Leistungspunkte:	25.0 LP	6. Turnus:	jedes Semester
4. SWS:	0.0	7. Sprache:	Englisch

8. Modulverantwortlicher:	Nico Sneeuw
9. Dozenten:	• Nico Sneeuw • Volker Schwieger • Dieter Fritsch • Alfred Kleusberg • Wolfgang Keller • Norbert Haala
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Geomatics Engineering → Mastermodul
11. Empfohlene Voraussetzungen:	At least 45 ECTS of mandatory and elective modules must be completed, including the corresponding examinations.
12. Lernziele:	With the Master Thesis the candidates are to demonstrate their ability to complete and document a well defined research project within a given time frame.
13. Inhalt:	Tbd according to the thesis topic
14. Literatur:	
15. Lehrveranstaltungen und -formen:	
16. Abschätzung Arbeitsaufwand:	Self-study and independent research work. A thesis supervisor is determined for each Master Thesis. This supervisor is available for consultations and, if necessary, guidance.
17. Prüfungsnummer/n und -name:	
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	