STUDIENDEKANAT
MASCHINENBAU

Leibniz
Universität
Hannover

Module Catalogue for PO 2017

St. Petersburg State
Polytechnical University

Study Guide for
International Mechatronics

Master of Science

academic year 18/19

Faculty of Mechanical Engineering
Faculty of Electrical Engineering and Computer Science

Fakultät für Maschinenbau
Fakultät für Elektrotechnik und Informatik

Leibniz Universität Hannover

Study Guide

for

International Mechatronics

With the degree

- Master of Science

Winter Terms 2018/19

This Study Guide is also available at:
http://www.mechatronik.uni-hannover.de/

Impressum

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Jördis Samland

Dear Student,

You are holding the course and module catalogue for the **M.Sc. International Mechatronics** programme. This degree programme crosses two borders. Firstly, mechatronics is itself an interdisciplinary field which unites knowledge and skills from the disciplines of mechanical, electrical and information engineering. It allows these technologies to be combined and integrated, providing benefit in daily life.

Secondly, the programme is offered as a co-operative venture between Leibniz Universität Hannover and Saint Petersburg State Polytechnical University. The first year is taught in Russia and the second year in Germany, allowing each student to experience two universities, two cultures and two countries. On successful completion of the programme, both German and Russian M.Sc. degrees are awarded. Graduates are therefore ideally qualified to work in global engineering and commerce.

After the first two semesters in Saint Petersburg, students progress to the second half of the programme in Hannover. Each student writes a project report, building upon their scientific and research work. This provides them with the skills necessary for the completion of their final master's degree thesis. Please remember that the master's degree thesis must be presented and defended in both Saint Petersburg and Hanover. The defence of the thesis, like the rest of the course, takes place in English.

The Teaching Office *(Studiendekanat)* is pleased to offer advice regarding the planning and organisation of your studies. Leibniz Universität Hannover also provides help with a wide range of student issues. Do not hesitate to take advantage of this assistance. Additionally, support can be found with experienced student representatives (at the *Fachschaftsrat*) and with the research associates of the various University Institutes.

We wish you every success.

Prof. Dr.-Ing. B. Ponick,
Faculty for Electrical and Information Engineering, Leibniz Universität Hannover

Prof. D. Sc. V. Shkodyrev,
Control Systems and Technologies Department, St. Petersburg State Polytechnical University

Prof. Dr.-Ing. S. Kabelac,
Faculty for Mechanical Engineering, Leibniz Universität Hannover

General information

This course and module catalogue details all courses and modules within the International Mechatronics programme. It has been carefully prepared by the teaching offices of the participating establishments, assisted by the University Institutes and module leaders. Each module consists of several courses, and it is the responsibility of each student to ensure that their course selection meets the requirements of their chosen modules.

The Leibniz Universität Hannover Mechatronics programme website http://www.mechatronik.uni-hannover.de/ provides detailed information regarding mechatronics programmes and the 2012 Examination Regulations. It also offers a variety of insights into the activities of the Faculties. Important information and news can be found on the website of the Mechatronics Student Council (http://www.fmec.uni-hannover.de/).

The Master of Science (M.Sc.) degree provides students with a higher professional qualification. Entry to a master's degree programme requires either a Bachelor of Science degree in an engineering subject, a Bachelor of Engineering degree, or a comparable degree. Further information can be found in the Admission Regulations. A master's degree programme normally lasts for 4 semesters.

Examinations

The examinations associated with the individual courses are held during the lecture-free period of each semester. Students should normally take a course and sit the corresponding examination in the same semester. Most examinations can be repeated, if necessary, in each semester. ECTS credit points are awarded for the successful completion of all courses, laboratory exercises, internships and design projects. The overall grade awarded for a module depends on the credit points and grades achieved for the component courses. On completion of the degree, both the overall grade awarded and the grades for specialist fields are derived from the module grades.

Credit points

When a student passes an examination, ECTS credit points will be awarded in addition to a grade. It is intended that 1 credit point corresponds to 30 hours of study. To successfully complete the master's degree programme, 120 credit points are required.

Structure and content of the programme

The two key aspects of the programme's content are a theoretical education, which is provided by lectures and exercises, and practical training offered by experimental work, independent projects and internships.

If a student has already covered the content of individual obligatory courses as part of their bachelor's degree, it may be possible to substitute optional courses for these obligatory courses. Decisions regarding such substitutions will be taken on a case-by-case basis by the Examination Board in consultation with the relevant lecturers. Before a student is allowed to begin work on their six-month master's degree project and thesis, all remaining academic work must be completed and the student must have passed the preliminary examination *(Vorprüfung)*.

Grading

Credit points are available for all successfully completed courses, laboratory exercises, design projects and internships. If a module consists of several graded components, the overall grade awarded will be a weighted average of the individual grades, with the weighting proportional to the number of credit points available for each component. The overall grade for the degree programme will be a weighted average of the module grades, with the weighting representing the available credit points in the same way.

Registration for course examinations

Registration for all examinations within the bachelor's and master's degree programmes takes place online. Registration periods will be announced in good time by the Examination Office, both online and on a notice board. The Examination Office publishes a list of candidates and passes this list on to the Institutes. Students must check the list to ensure that their examination registrations have been successful. Each student is free to decide which and how many examinations they wish to take in a given semester.

Withdrawal from an examination

Withdrawal from an examination for which a student has registered is possible until directly before the start of the examination. A student wishing to withdraw should speak to the relevant examiner directly.

If a student does not begin to take a particular examination, they will be automatically withdrawn by the Examination Office. Such students are not necessarily required to take the examination at a later date. However, once a student has taken an examination, they must pass this examination before completing their studies.

Examination failure

Within the programme, module examinations are assigned to various specialist fields. A module is considered to have been passed when all required credit points have been gained.

On average, a student must achieve 30 credit points per semester. At a minimum, 15 credit points much be achieved. If a student achieves fewer than 15 credit points in a semester, they are deemed to have failed the general examination. This can lead to expulsion from the University. On application, an academic hearing with representatives of the Examination Board may be granted. Further details can be obtained from the leaflet concerning the academic hearing process *(Anhörungsverfahren)*, or from the Teaching Office.

Continuous assessment

During the semester, certain assignments *(Teilprüfungen)* may be completed for credit. These can include homework, written tests and oral examinations. Participation is optional and the number of credit points available will be announced by the examiner at the start of the semester. In this case, the examination will consist of these assignments together with a final examination.

Student advice

A representative offering specialist student advice in mechatronics can be reached using the e-mail address mailbox@mec.uni-hannover.de.

Master of Science

International Mechatronics

	1. Semester / St. Petersburg (WiSe)	2. Semester / St. Petersburg (SuSe)	3. Semester / Hannover (WiSe)	4. Semester / Hannover (SuSe)
1	**Software Development Technology** (5 CP) Written Examination	**Scientific Discourse** (3 CP) Grading Test	**Production of optoelectronic Systems** **or** **Optical Measurement Technology** (5 CP) Written Examination	**Master`s Thesis** (30 CP)
2				
3				
4		**Knowledge Engineering and Knowledge Management** (4 CP) Written Examination		
5				
6	**History and Methodology of Science** (3 CP) Pass-fail Test		**Engineering Dynamics and Vibrations** **or** **Continuum Mechanics I** (5 CP) Written Examination	
7				
8		**Cognitive Multiagent Systems** (5 CP) Written Examination		
9	**Foreign Language in Professional Activity** (4CP) Written Examination			
10				
11			**Micro- and Nano Systems** (5 CP) Oral Examination	
12				
13	**Neuroinformatics and Neurotechnologies** (4CP) Written Examination	**Computing Systems** (4CP) WrittenExamination		
14				
15				
16			**Aspects of Process Design in Forming Technology** (5 CP) Written/Oral Examination	
17	**Methods of Optimisation and Decision Making** (4 CP) Written Examination	**Intelligent Computing** (4 CP) Written Examination		
18				
19				
20				
21	**Intelligent Systems** (4 CP) Written Examination	**Introduction Practice** (6 CP) Report	**Electrical Drives** (5 CP) Written/Oral Examination	
22				
23				
24				
25	**Project Work** (5 CP) Report		**Project Thesis based on scientific and research work** (5 CP)	
26				
27				
28		**Project Work** (5 CP) Report		
29				
30				
31				
LP	29	31	30	30
			Master complete	**120**

Modules and Courses

N.N. in the course lists indicates that the course will take place but that the lecturer is not yet known; the abbreviation means „nomen nominandum“ („the name is to be announced“). Courses with an asterisk (*) will always take place.

Modulname	Aspects of Process Design in Forming Technology
Modulname EN	Aspects of Process Design in Forming Technology

Verantw. Dozent/-in	Behrens, Krimm			Semester	WiSe
Institut	Institut für Umformtechnik und Umformmaschinen			ECTS	5
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	schriftlich
Präsenzstudienzeit	40	Selbststudienzeit	110	Kursumfang	V2/Ü1

Modulbeschreibung

This module provides an insight into the process of metal forming.
Objectives:
• Understanding of the basic principles for material characterisation and numerical simulation used for the analysis of forming processes • Ability to apply digital design tools to solve problems related to forming technology.

Content: After an introduction into the fundamentals of forming technology, the development of forming processes, the computer aided design process and the finite element analysis will be addressed. Experimentally determined parameters build the input for these analyses. The forming process takes place by use of various forming machines and peripheral devices. Subsequently, process-integrated quality assurance methods will be presented.

Vorkenntnisse

keine

Literatur

Handbook of Metal Forming, Lange, K.; McGraw-Hill, New York, 1985. R.H. Wagoner, J.L. Chenot: Fundamentals of Metal Forming, John Wiley and Sons, Inc. 1997 T. Altan, G. Ngaile, and G. Shen: Cold and Hot Forging, Fundamentals and Applications, ASM International, 2005 Bei vielen Titeln des Springer-Verlages gibt es im W-Lan der LUH unter www.springer.com eine Gratis Online-Version.

Besonderheit

Vorlesungssprache: Englisch

Modulname	Cognitive Multiagent Systems
Modulname EN	Cognitive Multiagent Systems

Verantw. Dozent/-in	Kapralov			Semester	SoSe
Institut	St.Petersburg State Polytechnical University			ECTS	5
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	schriftlich
Präsenzstudienzeit	72	Selbststudienzeit	78	Kursumfang	150h

Modulbeschreibung

Cognitive principles of the human nervous system: cognitive and effective systems; intelligence and knowledge structure, perception, decision-making, and execution; learning, self-learning, and self-organization; cognitive approach in intelligent systems. Cognitive components: logical, neural, and neurological modules; cognitive information processing; learning and self-learning; building of various modules; pruning and growing structures; models and algorithms of processing and learning. Applications of cognitive multi-agency systems: virtual teamwork games – soccer, basketball and so on; distributed industrial control systems; military strategic and tactic planning systems; humanoid robot and group robots control systems.

Vorkenntnisse

keine

Literatur

Barto A.G and Sutton R.S., Reinforcement Learning: An Introduction., The MIT Press, 1998; G. Weiss (Ed.), Multiagent systems: a modern approach to distributed artificial intelligence, MIT Press, Cambridge, Massachusetts, 2000. I. Cloette and J.M. Zurada (Eds.), Knowledge – Based Neurocomputing, The MII Press, 1999. P.E. Scafter and J.Campbell, Building Expet Systems: Cognitive Emulation,Helsted Press, 1989. S.J. Russel and P.Norvig, Artificial Intelligence: A Modern Approach., Pr.-Hall, Inc., 1995.

Besonderheit

Lectures are interspersed with short seminars on fresh developments in the field cognitive science. During semester students develop project of a multiagent system as a distributed artificial intelligence system. The course ends with a defense of a technology implementation report of a selected cognitive technology.

Modulname	Computing Systems
Modulname EN	Computing Systems

Verantw. Dozent/-in	Potekhin			Semester	WiSe
Institut	St.Petersburg State Polytechnical University			ECTS	5
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	schriftlich
Präsenzstudienzeit	54	Selbststudienzeit	66	Kursumfang	120

Modulbeschreibung

1. History and stages of evolution of computer engineering; classification of computer complexes and systems. 2. Designing of hardware and software for computing systems. 3. Planning of processes; levels, the purposes, criteria, parameters and algorithms of planning; cooperation of processes and the basic aspects of ist logic organization. 4. Hypermedia and system multimedia; the distributed databases and integration of resources with the distributed databases. 5. Software life cycle; technologies of working out of program complexes; technologies of an estimation of quality ON. 6. Standards of information support for products on stages of life cycle. 7. Technologies and means of e-learning; videoconferences; basic telecommunication systems; standards and communication protocols.

Vorkenntnisse

keine

Literatur

Khosrowpour M. Encyclopedia of Information Science and Technology, 2005. Minoli D. A Networking Approach to Grid Computing, 2004.

Besonderheit

The assessment will be done by a course project and an examination.

Modulname	Continuum Mechanics I
Modulname EN	Continuum Mechanics I

Verantw. Dozent/-in	Aldakheel			Semester	WiSe
Institut	Institut für Kontinuumsmechanik			ECTS	5
Art	☐ Pflicht ☑ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	mündlich
Präsenzstudienzeit	42	Selbststudienzeit	108	Kursumfang	V2/Ü2

Modulbeschreibung

description of the module: In Continuum Mechanics I basic tensor algebra and tensor analysis will be discussed. Based on that, concepts of kinematics, e.g. deformation, deformation gradient, strain tensor and polar decomposition will be introduced to account for 3D continuum. Finally the balance equations (mass balance, linear and angular momentum balance, 1st and 2nd law of thermodynamics) will be illustrated. Intended skills: For new technical development, understanding of the basic concepts of mechanics is essential to design a new product or process in an optimal way. Therefore, realistic modeling is needed. This subject handles the theoretical basics to estimate the real processes. It formulates along with the module "Finite Elements I-II" the basis for computational engineering. The course contents:

- Introduction to tensor calculus,
- Kinematics and stresses in 3D setting,
- Curvilinear coordinate system,
- Balance equations

Vorkenntnisse

Technische Mechanik I - IV

Literatur

Volesungsunterlagen und Holzapfel, G.A.: Nonlinear Solid Mechanics, Wiley 2000.

Besonderheit

The lectures are given in English.

Modulname	Electrical Drives: Small Electric Motors and Servo Drives
Modulname EN	Electrical Drives: Small Electric Motors and Servo Drives

Verantw. Dozent/-in				Semester	WiSe
Institut	Institut für Antriebssysteme und Leistungselektronik			ECTS	5
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	schriftlich
Präsenzstudienzeit	60	Selbststudienzeit	90	Kursumfang	V2/Ü1/L1

Modulbeschreibung

Fundamental of electromagnetics, Maxwell equations, Biot-Savart Formulation, Faraday law of induction, Lorentz Force. Fundamental of electromechanical energy conversion. Magnetic equivalent circuit for flux calculation in magnetic structures, magnetomotive force law, permanent magnet Materials, Ferromagnetic materials, non-linear BH-curves, Hysteresis and eddy current losses. Permanent magnet DC motor, separately excited DC motor, series DC motors, Universal motors, equivalent circuits and load calculation, lap and wave winding, armature reaction. Fundamentals of rotating field theory, three phase synchronous motor, permanent magnet synchronous motor, BLDC motors. Basics of control of electrical machines, basics of power electronic devices, pulse width modulation, basics of gearing and mechanical components in mechatronic systems, basic of sensory systems. Design of a mechatronic device, Biomechanical calculation, electromechanical drive calculation, selection of motor, gearing, battery, power electronics and sensory systems.

Vorkenntnisse

Basic knowledge of electrical engineering and electrical machines would be helpful.

Literatur

Stölting, Kallenbach, Amrhein: Handbook of Fractional-Horsepower Drives, Springer Verlag. Bei vielen Titeln des Springer-Verlages gibt es im W-Lan der LUH unter www.springer.com eine Gratis Online-Version.

Besonderheit

Keine

Modulname	Engineering Dynamics and Vibrations
Modulname EN	Engineering Dynamics and Vibrations

Verantw. Dozent/-in	Wallaschek, Wangenheim			Semester	WiSe
Institut	Institut für Dynamik und Schwingungen			ECTS	5
Art	☐ Pflicht ☑ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	schriftlich
Präsenzstudienzeit	56	Selbststudienzeit	94	Kursumfang	V2/Ü1/T1

Modulbeschreibung

Learning Objectives: In this module knowledge is imparted and consolidated in the field of describing and solving dynamical problems with multiple degrees of freedom (MDOF). If completed successfully, students are capable of

- Utilizing the terms natural frequencies, mode shapes, modal transformation in the correct manner
- Describing MDOF systems in the form of matrix differential equations
- Interpreting MDOF systems with respect to mode shapes, rigid body modes and effects like tuned mass damping
- Assessing critical operational states of machines and other dynamical systems like resonances, or instability regions
- Explaining the advantages to handle MDOF systems in modal space including proportional damping
- Using the Jeffcott rotor model (Laval shaft) to describe and calculate basic dynamic effects in rotor dynamics such as self-centering, anisotropic bearing rigidity, internal damping instability, gyroscopic effects.

Contents

- Natural frequencies und mode shapes of dynamics with multiple degrees of freedom
- Rigid body modes
- Initial value problem
- Modal transformation
- Modal/proportional damping
- Modal decoupling
- Laval shaft/Jeffcott rotor with unbalance excitation
- Damping and stability in rotor dynamics

Vorkenntnisse

Engineering Oscillations (Technische Mechanik IV)

Literatur

Inman, Daniel J.: Engineering Vibration. Prentice Hall. Meirowith: Fundamentals of Vibrations. McGraw-Hill

Besonderheit

Term paper based on Matlab/Simulink. Effort: 30 SWH

Modulname	Foreign Language in Professional Activity
Modulname EN	Foreign Language in Professional Activity

Verantw. Dozent/-in	N.N.			Semester	WiSe
Institut	St.Petersburg State Polytechnical University			ECTS	4
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	schriftlich
Präsenzstudienzeit	32	Selbststudienzeit	88	Kursumfang	

Modulbeschreibung

Vorkenntnisse

Literatur

Besonderheit

Modulname	History and Methodology of Informatics and Computer Science
Modulname EN	History and Methodology of Informatics and Computer Science

Verantw. Dozent/-in	Malykhina			Semester	SoSe
Institut	St.Petersburg State Polytechnical University			ECTS	2,5
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	schriftlich
Präsenzstudienzeit	36	Selbststudienzeit	54	Kursumfang	V2

Modulbeschreibung

The course deals with modern directions of computer science history and development, such as history and evaluation of operating systems; events processing and threads control ability; history and the present state of relational and object-oriented databases; computer networking and client-server interaction.

- mathematical logic and the theory of algorithms;
- cybernetics and computer science;
- computer mathematics; numerical methods and analytical calculations;
- programming languages and technology development;
- computer graphics and multimedia systems.

Vorkenntnisse

keine

Literatur

Java-2 certification study guide. S. Roberts, P. Heller, M. Ernest, San Francisco, 1999. Java security handbook. J. Jaworski, P. Perrone. a division of Macmillan Computer Publishing, USA 2001.

Besonderheit

keine

Modulname	Intelligent Computing
Modulname EN	Intelligent Computing

Verantw. Dozent/-in	Kuchmin			Semester	SoSe
Institut	St.Petersburg State Polytechnical University			ECTS	7
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	schriftlich
Präsenzstudienzeit	54	Selbststudienzeit	66	Kursumfang	120

Modulbeschreibung

The objective of this course is to study the base aspects in the fields of modern computer science, computational intelligence, software and hardware of intellectual systems. During this course students will: learn main technologies, approaches and methods of computational intelligence; learn modern aspects in software and hardware of intellectual systems; implement modern aspects of intellectual computing, and implement neuro-computers and fuzzyprocessors for solving variable applied tasks. Main topics: Robotics systems; Fuzzy Logic; Preprocessing; Adaptive Resonance Theory; Expert System; Artificial Immune Systems; DNA-computing; Swarm Intelligence; Hybrid Systems; Evolutionary Computation; Intellectual Hardware; Intellectual Software.

Vorkenntnisse

keine

Literatur

Konar, Computational Intelligence, Springer Berlin Heidelberg 2004; A. P. Engelbrecht Fundamentals of computational swarm intelligence, Hoboken NJ Wiley, 2005. Stuart J. Russell and Peter Norvig: Artificial Intelligence. A Modern Approach, Prentice Hall. Andries P. Engelbrecht Fundamentals of computational swarm intelligence, Hoboken NJ Wiley, 2005. D.E.Goldberg Genetic Algorithms in Search, Optimization and Machine Learning, Addison-Wesley Publishing Company, Inc., 2003. Du Zhang, J.P. Jeffrey Machine Learning Application in Software Engineering, World Scientific, 2005.

Besonderheit

The Assessment is done by a course project and a examination

Modulname	Intelligent Systems
Modulname EN	Intelligent Systems

Verantw. Dozent/-in	Yarotskiy			Semester	WiSe
Institut	St.Petersburg State Polytechnical University			ECTS	3
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	schriftlich
Präsenzstudienzeit	36	Selbststudienzeit	84	Kursumfang	120

Modulbeschreibung

The purpose of the course is to prepare the student for practical activities in the field of creation, introduction and operation of intellectual systems. The goals of this course are to acquaint the student with brief history of becoming and development of artificial intellect (AI); to consider technical statements of the primary goals solved by systems of artificial intellect; to acquaint with modern areas of research on an artificial intellect; to acquaint with the basic models of representation of knowledge in intellectual systems; to consider theoretical and some practical questions of creation and operation of expert systems.

1. The theoretical problems solved by AI.
2. Practical application areas of AI methods.
3. Logic.
4. Production rules.
5. Languages of the description production models Prolog and Lisp.
6. Semantic networks.

Vorkenntnisse

keine

Literatur

keine

Besonderheit

The assessment will be done by an examination.

Modulname	Introduction Practice
Modulname EN	Introduction Practice

Verantw. Dozent/-in	N.N.			Semester	SoSe
Institut	St.Petersburg State Polytechnical University			ECTS	6
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	Leistungsnachweis
Präsenzstudienzeit	32	Selbststudienzeit	148	Kursumfang	

Modulbeschreibung

Vorkenntnisse

Literatur

Besonderheit

Modulname	Knowledge Engineering and Knowledge Management
Modulname EN	Knowledge Engineering and Knowledge Management

Verantw. Dozent/-in	Kudryavtsev			Semester	WiSe
Institut	St.Petersburg State Polytechnical University			ECTS	4
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	schriftlich
Präsenzstudienzeit	64	Selbststudienzeit	56	Kursumfang	120

Modulbeschreibung

The course will introduce the underlying theme of the new degree, methodological data and knowledge processing. Knowledge engineering will be defined as an information structuring methodology for different domains. Characteristics of knowledge engineering include the principles, practices, issues, methods, techniques and programs involved with the knowledge elicitation, structuring and formalizing.
1. Elicit, structure and formalize knowledge acquired from different sources
2. Think creatively about and understand the strategic role of knowledge acquisition techniques in information processing and the role of information analysts in this area
3. Contribute to increasing the creativity and productivity of information processing and working with different information.

Vorkenntnisse

keine

Literatur

Applehans, Wayne, Globe Alden, Laugero Greg: Managing Knowledge: A Practical Web-Based Approach. Addison-Wesley Pub Co, 1998. Debenham, John: Knowledge Engineering: Unifying Knowledge Base and Database Design., Springer Verlag 1998. M., Vincent: The Knowledge Web. Eisenstadt, T Knowledge Media Institute 1998. Fensel, Dieter: Ontologies: A Silver Bullet for Knowledge Management and Electronic Commerce. Springer Verlag, 2001. Gomez-Perez, Asuncion, Richard Benjamins (Eds.): Knowledge Engineering and Knowledge Management. Ontologies and the Semantic Web. Springer Verlag 2002.

Besonderheit

Use popular scientific and business software (Mind Manager, Cmap Tool, K-vision, etc.) for knowledge structuring and knowledge base development.

Modulname	Masterarbeit
Modulname EN	Master Thesis

Verantw. Dozent/-in	Professorinnen und Professoren der Fakultät für Maschine	Semester	Wi-/SoSe
Institut	Diverse	ECTS	30
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien		
Vertiefungsrichtung		Prüfungsform	schrift./münd.
Präsenzstudienzeit		Selbststudienzeit	Kursumfang 900h

Modulbeschreibung

Nach dem erfolgreichen Absolvieren des Moduls sind Studierende in der Lage an einer wissenschaftlichen Problemstellung aus den Themenfeldern des Master-Studiums mitzuarbeiten, Teilprobleme in bestehende Theorien einzuordnen und im Studium erlernte Methoden geeignete Methoden zu identifizieren. Sie können erreichte Ergebnisse wissenschaftlich formulieren und dabei übliche Zitierregeln und Recherchemethoden anwenden.
Durch die Teilnahme am Modul Masterarbeit üben Studierende gänginge Tätigkeiten von Ingenieurinnen und Ingenieuren aus, die in der Forschung, der Industrie oder dem Entrepreneurwesen tätig sind.

Vorkenntnisse

keine

Literatur

Diverse

Besonderheit

Zum Modul gehört das erfolgreiche Präsentieren der Abschlussarbeit (1 LP)

Modulname	Methods of Optimisation and Decision Making
Modulname EN	Methods of Optimisation and Decision Making

Verantw. Dozent/-in	Rodionova			Semester	WiSe
Institut	St.Petersburg State Polytechnical University			ECTS	4
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	schriftlich
Präsenzstudienzeit	36	Selbststudienzeit	84	Kursumfang	V1/Ü2

Modulbeschreibung

The main objective of the course is to display basic concepts of the optimization theory and numerical methods of solving extremal problems. The course provides profound knowledge of numerical optimization techniques and demonstrates examples of technical and economic applications.
1. Mathematical programming: theory and applications;
2. Data analysis and decision making problems;
3. Decision making under uncertainty;
4. Optimal control theory and numerical methods;
5. Applications of ANN and GA in the problems of optimization

Vorkenntnisse

Modern Problems of Informatics and Computer Science

Literatur

keine

Besonderheit

The assessment will be done by course work within the course.

Modulname	Micro- and Nanosystems
Modulname EN	Micro- and Nanosystems

Verantw. Dozent/-in	Wurz			Semester	WiSe
Institut	Institut für Mikroproduktionstechnik			ECTS	5
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	mündlich
Präsenzstudienzeit	32	Selbststudienzeit	118	Kursumfang	V2/Ü1

Modulbeschreibung

Students gain knowledge about the most important application areas of micro- and nano technology. A microtechnical system has the following components: micro sensor technology, micro actuating elements, microelectronics. Furthermore, the active principle and construction of micro components as well as requirements of system integration will be explained.
Nanosystems usually use quantum mechanical effects. An example will be the display of the employment of nanotechnology in various areas

Vorkenntnisse

Mikro- und Nanotechnolgie

Literatur

Vorlesungsskript; Hauptmann: Sensoren, Prinzipien und Anwendungen, Carl Hanser Verlag, München 1990; Tuller: Microactuators, Kluwer Academic Publishers, Norwell 1998.

Besonderheit

This lecture is given in English and German. In addition to a separate exam (4 credits), an online test will be conducted (1 credits). Both must be performed to pass the module. The grade is composed proportionate.

Modulname	Neuroinformatics and Neurotechnologies
Modulname EN	Neuroinformatics and Neurotechnologies

Verantw. Dozent/-in	Shkodyrev			Semester	WiSe
Institut	St.Petersburg State Polytechnical University			ECTS	4
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	schriftlich
Präsenzstudienzeit	54	Selbststudienzeit	66	Kursumfang	V2/Ü1

Modulbeschreibung

The objectives of the course are to provide an evaluation of new computation paradigms of artificial intelligence and brain-like computing intelligence for a large class of intellectual ill-formalising tasks solution; to develop an understanding of a new mathematical theory of self-organizing & adaptive machine learning algorithms via artificial neural networks paradigms; to gain experience of the main requiremens

1. Mathematical backgrounds of NN: learning via optimization problem.
2. Perceptron and threshold logic classification.
3. Multilayer feedforward networks.
4. Laboratory training with the fulfillment of a set of exercises. The use of LabView graphical programming system for real experiments and modelling problems solution

Vorkenntnisse

keine

Literatur

Neural Networks: A Comprehensive Foundation. Second Edition. Haykin S. Prentice Hall, Inc., New Jersey, 1999. Neural Network Design Hagan M.T., Demuth H.B., Beale M. PWS Publishing Comp. 1995.

Besonderheit

The assessement will be done by a examination course project

Modulname	Optische Messtechnik / Optical Measurement
Modulname EN	Optical Measuring Technique

Verantw. Dozent/-in	Reithmeier, Reithmeier			Semester	WiSe
Institut	Hannoversches Zentrum für Optische Technologien			ECTS	5
Art	☐ Pflicht ☑ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	schrift./münd.
Präsenzstudienzeit	58	Selbststudienzeit	92	Kursumfang	V2/Ü2

Modulbeschreibung

Qualifikationsziele Das Modul vermittelt Grundlagen und Messverfahren in der optischen Messtechnik. Nach erfolgreicher Absolvierung des Moduls sind die Studierenden in der Lage,
- die strahlen- und wellenoptischen Grundlagen kompetent darzustellen
- die in der optischen Messtechnik eingesetzten Verfahren und typische Einsatzgebiete fachlich korrekt einzuordnen,
- die typischen Mess- und Charakterisierungstechniken detailliert zu beschreiben,
- Methoden zur optischen Charakterisierung und Kalibrierung in der optischen Messtechnik zu verstehen,
- die in der Messtechnik häufig verwendete optische Bauelemente und ihre Funktion detailliert zu bewerten,
- neue Konzepte zu optischen Messtechnik-Aufgaben auszuarbeiten.

Inhalte
- Strahlen und wellenoptische Grundlagen der optischen Messtechnik
- Optische Messverfahren zur Topographie-, Abstands-, Schwingungs- und Verformungsmessung
- Faseroptische Sensor-Konzepte
- Interferometrie, Holographie, Laser Doppler Vibrometrie
- Konfokale Mikroskopie, Optische Kohärenztomographie und Nahfeldmikroskopie
- Methoden zur optischen Charakterisierung und Kalibrierung

Vorkenntnisse

Messtechnik I

Literatur

Born, Wolf. Principles of Optics: Electromagnetic Theory of Propagation, Interference and Diffraction of Light; Demtröder: Experimentalphysik; Saleh, Teich: Grundlagen der Photonik; Lauterborn, Kurz: Coherent Optics; Goodman: Introduction to Fourier Optics; Hugenschmidt: Lasermesstechnik; Bei vielen Titeln des Springer-Verlages gibt es im W-Lan der LUH unter www.springer.com eine Gratis Online-Version.

Besonderheit

Prüfung je nach Teilnehmerzahl: Einzelprüfung mündlich 20 Min. oder schriftlich 90 Min.

Modulname	Production of Optoelectronic Systems
Modulname EN	Production of Optoelectronic Systems

Verantw. Dozent/-in	Overmeyer			Semester	WiSe
Institut	Institut für Transport- und Automatisierungstechnik			ECTS	5
Art	☐ Pflicht ☑ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	schriftlich
Präsenzstudienzeit	40	Selbststudienzeit	110	Kursumfang	V2/Ü2

Modulbeschreibung

Outcomes: This module gives basic knowledge about processes and devices that are used in production of semiconductor packages and microsystems. The main focus is on the back-end-process that means the process thins wafer dicing. After successful examination in this module the students are able to

- correctly use the terms optoelectronic system, wafer production, front end and back end and to give an overview of production processes of semiconductor packages
- explain the production processes beginning from crude material sand and to have an idea about process relevant parameters
- visualize different packaging techniques and explain the corresponding basics of physics
- choose and classify different package types for an application

Contents:

- Wafer production
- Mechanical Wafer treatment
- Mechanical connection methods (micro bonding, soldering, eutectic bonding)
- Electrical connection methods (wire bonding, flip chip bonding, TAB)
- Package types for semiconductors
- Testing and marking of packages
- Design and production of printed circuit boards
- Printed circuit board assembly and soldering techniques

Vorkenntnisse

Keine

Literatur

Lau, John H.: Low cost flip chip technologies : for DCA, WLCSP, and PBGA assemblies. McGraw-Hill, New York 2000. Pecht, Michael: Integrated circuit, hybrid, and multichip module package design guidelines : a focus on reliability. Wiley, New York 1994. Bei vielen Titeln des Springer-Verlages gibt es im W-Lan der LUH unter www.springer.com eine Gratis Online-Version.

Besonderheit

Keine

Modulname	Scientific and Research Work
Modulname EN	Scientific and Research Work

Verantw. Dozent/-in	Shkodyrev			Semester	Wi-/SoSe
Institut	St.Petersburg State Polytechnical University			ECTS	6,5
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	schrift./münd.
Präsenzstudienzeit	0	Selbststudienzeit	300	Kursumfang	300h

Modulbeschreibung

The scientific and research work enables each student to practise research techniques, literature review, academic discussion, scientific writing and the practical application of specialist knowledge. After completion of the course, each student becomes familiar with a current research theme and assumes responsibility for a small project. The project is completed under guidance, with the student documenting the results in written form, giving a presentation and finally leading an academic discussion on the subject.

Vorkenntnisse

keine

Literatur

Holman, J. P.: Experimental Methods for Engineers, Mcgraw-Hill Publ.Comp. Ackerson, L.G.: Literature Search Strategies for Interdisciplinary Research: A Sourcebook For Scientists and Engineers. Scarecrow Press.

Besonderheit

keine

Modulname	Scientific Discourse
Modulname EN	Scientific Discourse

Verantw. Dozent/-in	N.N.			Semester	SoSe
Institut	St.Petersburg State Polytechnical University			ECTS	3
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	Leistungsnachweis
Präsenzstudienzeit	32	Selbststudienzeit	58	Kursumfang	

Modulbeschreibung

Vorkenntnisse

Literatur

Besonderheit

Modulname	Scientific Research Work: Mechatronics Lessons
Modulname EN	Scientific Research Work: Mechatronics Lessons

Verantw. Dozent/-in	Ortmaier			Semester	Wi-/SoSe
Institut	Institut für Mechatronische Systeme			ECTS	5
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	schrift./münd.
Präsenzstudienzeit	16	Selbststudienzeit	104	Kursumfang	Ü

Modulbeschreibung

The scientific and research work enables each student to practise research techniques, literature review, academic discussion, scientific writing and the practical application of specialist knowledge. After completion of the course, each student becomes familiar with a current research theme and assumes responsibility for a small project. The project is completed under guidance, with the student documenting the results in written form, giving a presentation and finally leading an academic discussion on the subject.

Vorkenntnisse

keine

Literatur

Holman, J. P.: Experimental Methods for Engineers, Mcgraw-Hill Publ.Comp. Ackerson, L.G.: Literature Search Strategies for Interdisciplinary Research: A Sourcebook For Scientists and Engineers. Scarecrow Press.

Besonderheit

Keine

Modulname	Software Development Technology
Modulname EN	Software Development Technology

Verantw. Dozent/-in	Chernosvitov			Semester	WiSe
Institut	St.Petersburg State Polytechnical University			ECTS	5
Art	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Studium generale / Tutorien				
Vertiefungsrichtung				Prüfungsform	schriftlich
Präsenzstudienzeit	36	Selbststudienzeit	114	Kursumfang	V2/Ü1

Modulbeschreibung

The course develops skills of using the object-oriented approach in applications programming on the basis of classes library usage:.NET Framework Classes on a platform.NET CLR; shared languages C#, C++ and Visual Basic 7.0.
1. New ways of building Windows-based applications and Web applications.
2. New approaches based on the principle of the Windows operating system fundamentals.
3. Message handling mechanisms.
4. The structure of a standard Windows application based on API elements: functions, macro extensions, messages, interfaces.

Vorkenntnisse

Methods of Optimization, Neuroinformatics and Neurotechnologies

Literatur

keine

Besonderheit

keine