STUDIENDEKANAT
MASCHINENBAU

Leibniz
Universität
Hannover

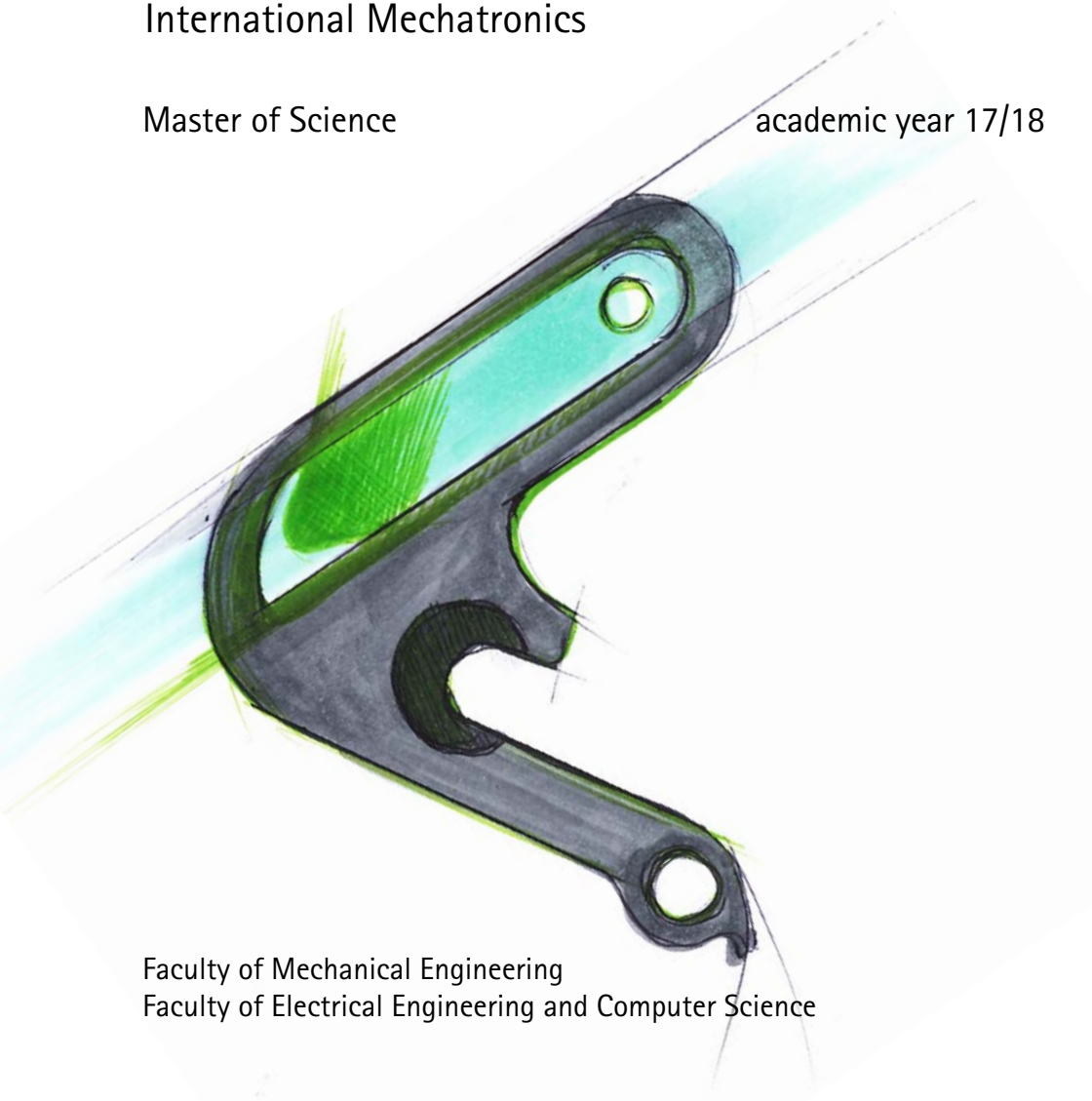
Module Catalogue for PO 2017

St. Petersburg State
Polytechnical University

Study Guide for
International Mechatronics

Master of Science

academic year 17/18



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 2017/18

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

Impressum

Herausgeber

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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,
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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** (4 CP) Written Examination	**History and Methodology of Informatics and Computer Science** (2,5 CP) Written Examination	**Production of optoelectronic Systems** (5 CP) Written Examination	**Master`s Thesis** (30 CP)
2				
3				
4		**History and Methodology of Informatics and Computer Science (2,5 CP) Written Examination**		
5	**Neuroinformatics and Neurotechnologies** (4 CP) Written Examination			
6			**Engineering Dynamics and Vibrations** (5 CP) Written Examination	
7				
8				
9	**Modern Problems of Informatics and Computer Science** (4CP) Written Examination	**Cognitive and Multiagent Systems or Intelligent Control Systems** (8,5 CP) Written Examination		
10				
11			**Micro- and Nano Systems** (5 CP) Oral Examination	
12				
13	**Methods of Optimisation** (2CP) Written Examination			
14				
15	**Intelligent Systems** (3CP) Written Examination			
16			**Aspects of Process Design in Forming Technology** (5 CP) Written/Oral Examination	
17		**Mathematical Modelling and Simulation** (5 CP) Written Examination		
18	**Knowledge Management and Knowledge Enigineering** (6,5 CP) Written Examination			
19				
20				
21			**Electrical Drives** (5 CP) Written/Oral Examination	
22				
23		**Distributed Databases (7 CP) or Intelligent Computing (7 CP) Written Examination**		
24	**Scientific and research work** (6,5 CP)			
25				
26			**Project Thesis based on scientific and research work** (5 CP)	
27				
28				
29		**Scientific and research work** (2 CP)		
30				
31				

LP	30	30	30	30
			Master complete	**120**

4 CP Scientific and research work will still be assigned to the 5 courses of the 3rd semester.

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			Semester	WiSe
Institut	Institut für Umformtechnik und Umformmaschinen			ETCS	5
Prüfungsform	schrift./münd.	☑ Pflicht	☐ Wahlpflicht	☐ Wahl	☐ Stud. Gen. / Tutorien
Präzenzstudienzeit	40	Selbststudienzeit	110	Kursumfang	V2/Ü1

Modulbeschreibung

Content: After an introduction into the fundamentals of metal forming technology, the development and production process of non-cutting formed products will be addressed on selected milestones. The path leads initially to the computer aided design process, before design is tested by finite element analysis. Experimentally determined parameters build the input for these analyses. The forming process takes place by use of various forming machines and peripheral devices. Examples will be given how mechatronic systems are integrated in such technical environment and which questions arise from this connection. Closing, process-integrated quality assurance methods will be presented. Objectives: This course enables the student to understand the material characterization and numerical simulations for the analysis of forming processes. Furthermore will the students be able to apply computer design tool to solve problems related to forming technology.

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 Internat

Besonderheit

Keine

Modulname	Cognitive and Multiagent Systems
Modulname EN	Cognitive and Multiagent Systems

Verantw. Dozent/-in	Kapralov			Semester	SoSe
Institut	St.Petersburg State Polytechnical University			ETCS	8,5
Prüfungsform	schriftlich	☐ Pflicht ☑ Wahlpflicht ☐ Wahl ☐ Stud. Gen. / Tutorien			
Präzenzstudienzeit	72	Selbststudienzeit	183	Kursumfang	255h

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

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 techno

Modulname	Distributed Databases
Modulname EN	Distributed Databases

Verantw. Dozent/-in	Malykhina			Semester	WiSe
Institut	St.Petersburg State Polytechnical University			ETCS	7
Prüfungsform	schriftlich	☐ Pflicht ☑ Wahlpflicht ☐ Wahl ☐ Stud. Gen. / Tutorien			
Präzenzstudienzeit	54	Selbststudienzeit	156	Kursumfang	210

Modulbeschreibung

Databases development, relational and post relational databases, warehouses, OLAP systems. Data mining and knowledge discovery problems. Data modelling, entity-relationship diagrams and relational data model. Relations, attributes, tuples, schemas. Operations of relation algebra. Simple quarries, multiplication and union in SQL, attribute specification, quarries intersection and subtraction, sub-quarries implementation. Aggregation, grouping in SQL, tables modification, updating, tuples insertion and indexes creation. PL/SQL language for Oracle DBMS. Sheared variables, cursors and transactions. Parallelism problems, premature reading, unrepeatable reading, lost update, phantom insert. The applications of database design are given by Oracle PL/SQL programming.

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

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

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

Verantw. Dozent/-in	Stübig			Semester	WiSe
Institut	Institut für Antriebssysteme und Leistungselektronik			ETCS	5
Prüfungsform	schrift./münd.	☑ Pflicht	☐ Wahlpflicht	☐ Wahl	☐ Stud. Gen. / Tutorien
Präzenzstudienzeit	60	Selbststudienzeit	90	Kursumfang	V2/Ü1/L1

Modulbeschreibung

This lecture gives a basic overview of electrical machine types with special emphasis on small motors and servo drives with an output power smaller than 1 kW. This includes knowledge on construction, in-service behaviour and control as well as application range and economic importance of these motors. The lecture is designed for developers of drive systems and for users of small electrical machines in order to support them in the choice of a motor in a specific case of operation.

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 Vibration
Modulname EN	Engineering Dynamics and Vibration

Verantw. Dozent/-in	Wallaschek			Semester	WiSe
Institut	Institut für Dynamik und Schwingungen			ETCS	5
Prüfungsform	mündlich	☑ Pflicht	☐ Wahlpflicht	☐ Wahl	☐ Stud. Gen. / Tutorien
Präzenzstudienzeit	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 Bei vielen Titeln des Springer-Verlages gibt es im W-Lan der LUH unter www.springer.com eine Gratis Online-Version.

Besonderheit

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

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			ETCS	2,5
Prüfungsform	schriftlich	☑ Pflicht	☐ Wahlpflicht	☐ Wahl	☐ Stud. Gen. / Tutorien
Präzenzstudienzeit	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			ETCS	7
Prüfungsform	schriftlich	☐ Pflicht	☑ Wahlpflicht	☐ Wahl	☐ Stud. Gen. / Tutorien
Präzenzstudienzeit	54	Selbststudienzeit	156	Kursumfang	210

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.

Besonderheit

The Assessment is done by a course project and a examination

Modulname	Intelligent Control Systems
Modulname EN	Intelligent Control Systems

Verantw. Dozent/-in	Kapralov			Semester	SoSe
Institut	St.Petersburg State Polytechnical University			ETCS	8,5
Prüfungsform	schriftlich	☐ Pflicht ☑ Wahlpflicht ☐ Wahl ☐ Stud. Gen. / Tutorien			
Präzenzstudienzeit	72	Selbststudienzeit	198	Kursumfang	

Modulbeschreibung

Theory and architectures of intelligent control systems. Introduction to intelligent control systems with high degrees of autonomy. Model-based architecture concepts for autonomous systems design and simulation. Design of structure-based hierarchies for distributed intelligent control. Modeling and design of distributed intelligence systems. Nested hierarchical control Approaches and techniques to intelligent control system design. Expert and rule-based control. Modeling and analysis of artificially intelligent planning systems. Fuzzy and neural control systems. Learning control: methods, needs and architectures. Applications of intelligent control. Intelligent robotic systems with failure diagnostic capabilities. A framework for knowledge-based diagnosis in process operations.

Vorkenntnisse

keine

Literatur

Panos J. Antsaklis and Kevin M. Passino (Eds): An Introduction to Intelligent and Autonomous Control, Academic Publishers 1993. K.M. Hangos, R. Lakner, M. Gertzon: Intelligent Control Systems: An Introduction with Examples, Kluwer Academic Publishers, 200

Besonderheit

keine

Modulname	Intelligent Systems
Modulname EN	Intelligent Systems

Verantw. Dozent/-in	Yarotskiy			Semester	WiSe
Institut	St.Petersburg State Polytechnical University			ETCS	3
Prüfungsform	schriftlich	☑ Pflicht	☐ Wahlpflicht	☐ Wahl	☐ Stud. Gen. / Tutorien
Präzenzstudienzeit	36	Selbststudienzeit	54	Kursumfang	90

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

Verantw. Dozent/-in	Kudryavtsev			Semester	WiSe
Institut	St.Petersburg State Polytechnical University			ETCS	6,5
Prüfungsform	schriftlich	☑ Pflicht	☐ Wahlpflicht	☐ Wahl	☐ Stud. Gen. / Tutorien
Präzenzstudienzeit	64	Selbststudienzeit	156	Kursumfang	210

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 Knowl

Besonderheit

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

Modulname	Mathematical Modelling and Simulation
Modulname EN	Mathematical Modelling and Simulation

Verantw. Dozent/-in	Senichenkov			Semester	SoSe
Institut	St.Petersburg State Polytechnical University			ETCS	5
Prüfungsform	schriftlich	☑ Pflicht	☐ Wahlpflicht	☐ Wahl	☐ Stud. Gen. / Tutorien
Präzenzstudienzeit	54	Selbststudienzeit	96	Kursumfang	V2/Ü2

Modulbeschreibung

1. Mathematical modelling is the basis of investigation and designing of complex and dynamic real-world systems. 2. Computer-based present state of mathematical modelling. 3. Changes in traditional designing technologies due to computers application for modelling and 4. Simulation of complex systems. 5. Fundamental importance of changes. 6. Mathematical modelling as a component of computer modelling . 7. Computer modeling as the basis for computer designing technologies

Vorkenntnisse

Software Development Technology, Modern Problems of Informatics and Computer Science

Literatur

Nicolas J. Highan: MATLAB Guide Desmond. 2000. Ascher Uri m, L.R. Petzold: Computer methods for ordinary differential equations and differential-algebraic equations. 1998.

Besonderheit

The assessment will be done by course work and examination.

Modulname	Methods of Optimization
Modulname EN	Methods of Optimization

Verantw. Dozent/-in	Rodionova			Semester	WiSe
Institut	St.Petersburg State Polytechnical University			ETCS	2
Prüfungsform	schriftlich	☑ Pflicht	☐ Wahlpflicht	☐ Wahl	☐ Stud. Gen. / Tutorien
Präzenzstudienzeit	36	Selbststudienzeit	24	Kursumfang	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			ETCS	5
Prüfungsform	mündlich	☑ Pflicht	☐ Wahlpflicht	☐ Wahl	☐ Stud. Gen. / Tutorien
Präzenzstudienzeit	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

Modulname	Modern Problems of Computers and Information Science
Modulname EN	Modern Problems of Computers and Information Science

Verantw. Dozent/-in	Rodionova			Semester	WiSe
Institut	St.Petersburg State Polytechnical University			ETCS	4
Prüfungsform	schriftlich	☑ Pflicht	☐ Wahlpflicht	☐ Wahl	☐ Stud. Gen. / Tutorien
Präzenzstudienzeit	54	Selbststudienzeit	66	Kursumfang	V2/Ü2

Modulbeschreibung

The main objective of the course is to display fundamental concepts and new achievements of informational technologies and resources and their applications in different fields of human activity. The course provides the profound knowledge of modern optimization techniques playing an increasingly important role in controlling and planning, system analysis, designing, industrial automation, communications and management science. 1. Structure, formalize and describe mathematical model of practical problem. 2. Choose and investigate corresponding optimization algorithm. 3. Construct optimization analysis program to select the best decision. 4. Construct technical report and provide data analysis of optimal project. 5. Use popular scientific software (Matlab,MathCAD,GeneHunter, etc.) for optimization analysis and modeling.

Vorkenntnisse

keine

Literatur

Konar A.: Artificial Intelligence and Soft Computing. London:CRC Press 2000. Hilborn R.,C.: Chaos and Nonlinear Dynamics. NY.:Oxford University Press 2000. Gen M.,Cheng R.: Genetic Algorithms and Engineering Optimization. New-York. 2000. Jang J.S.: ANFIS:

Besonderheit

keine

Modulname	Neuroinformatics and Neurotechnologies
Modulname EN	Neuroinformatics and Neurotechnologies

Verantw. Dozent/-in	Shkodyrev			Semester	WiSe
Institut	St.Petersburg State Polytechnical University			ETCS	4
Prüfungsform	schriftlich	☑ Pflicht	☐ Wahlpflicht	☐ Wahl	☐ Stud. Gen. / Tutorien
Präzenzstudienzeit	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	Production of Optoelectronic Systems
Modulname EN	Production of Optoelectronic Systems

Verantw. Dozent/-in	Overmeyer			Semester	WiSe
Institut	Institut für Transport- und Automatisierungstechnik			ETCS	5
Prüfungsform	schriftlich	☑ Pflicht	☐ Wahlpflicht	☐ Wahl	☐ Stud. Gen. / Tutorien
Präzenzstudienzeit	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

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			ETCS	6,5
Prüfungsform	schrift./münd.	☑ Pflicht	☐ Wahlpflicht	☐ Wahl	☐ Stud. Gen. / Tutorien
Präzenzstudienzeit	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 Research Work: Mechatronics Lessons
Modulname EN	Scientific Research Work: Mechatronics Lessons

Verantw. Dozent/-in	Ortmaier			Semester	Wi-/SoSe
Institut	Institut für Mechatronische Systeme			ETCS	4
Prüfungsform	schrift./münd.	☑ Pflicht	☐ Wahlpflicht	☐ Wahl	☐ Stud. Gen. / Tutorien
Präzenzstudienzeit	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			ETCS	4
Prüfungsform	schriftlich	☑ Pflicht ☐ Wahlpflicht ☐ Wahl ☐ Stud. Gen. / Tutorien			
Präzenzstudienzeit	36	Selbststudienzeit	84	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