Reutlingen University
School of Engineering

Engineering Courses in English for Exchange Students

International Project Engineering, Bachelor

Foundations of Project Leadership	
Study Program **Study level and semester**	International Project Engineering Bachelor, 1st Semester
ECTS Credits	2
Hours per week / **total contact hours**	2 / 30
Total hours of study	90
Type/Teaching Method	Seminar-style lecture
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr.-Ing. Jochen Brune, MBA E-Mail: Jochen.brune@reutlingen-university.de
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course
Prerequisites:	None
Course learning objectives:	At the end of the course students should: Professional competencies - be able to describe the fundamental principles of leadership in projects. Methodological competencies - be able to describe and apply the fundamental methods and techniques for project leadership. Social competencies - be able to analyze communication failures and create communication strategies in leadership situations. Conflicts and negotiation situations are understood and actively managed. The fundamentals of human motivation, personal preferences and team behavior are understood and practically applied to lead a project to success. Personal competencies - develop an understanding of the requirements towards a project leader. At the end of this course students solve complex leadership problems individually as well as in a team setup. International competencies - gain insights into the challenges of leading international projects. They are able to express

	the results of their analysis using correct technical terms in the English language.
Contents:	Fundamental methods and techniques for project leadership: Creativity techniques, problem solving techniques, communication and communication failures, communication in leadership situations, conflicts and conflict management, Negotiation, personality & preferences, influencing others, motivation, team management, virtual teams
Textbooks:	- Meredith, Jack; Mantel, Samuel: 'Project Management – A Managerial Approach', 9th ed. (International Student Version), Wiley, 2015 - de Bono, Edward: Serious Creativity. Stuttgart: Schäffer-Poeschel, 1996. Additional: - Kerzner, Harold: 'Project Management: A Systems Approach to Planning, Scheduling, and Controlling ', John Wiley & Sons; 12th Ed. (2017) - Kompetenzbasiertes Projektmanagement (PM3) (für GPM Level A-D) Handbuch für die Projektarbeit, Qualifizierung und Zertifizierung auf Basis der IPMA Competence Baseline Version 3.0, GPM Deutsche Gesellschaft für Projektmanagement / Michael Gessler (Hrsg.), 4. Auflage, GPM, Nürnberg, 2011
Assessment	Graded: Case Study and Written Exam

Foundations of Project Planning	
Study Program **Study level and semester**	International Project Engineering Bachelor, 2nd Semester
ECTS Credits	3
Hours per week / **total contact hours**	2 / 30
Total hours of study	120
Type/Teaching Method	Seminar-style lecture
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr.-Ing. Jochen Brune, MBA E-Mail: Jochen.brune@reutlingen-university.de
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course
Prerequisites:	None
Course learning objectives:	At the end of the course students should: Professional competencies - be able to describe the fundamental principles of project management. Methodological competencies - be able to practically apply important methods and techniques of classical project management to successfully plan a project. They are able to plan a project regarding scope, schedule, cost and quality. They are able to analyze a given project in detail and to optimize it regarding scope, schedule, cost and quality. Personal competencies - understand why structuring and planning are prerequisites for successful execution of complex projects. International competencies - be able to analyze the context of an international project. They are able to express the result of their analysis using correct technical terms in English.
Contents:	Introduction to classical project management methods and techniques, with the focus on structured project planning and optimization. Fundamental principles of project management: Projects, triple constraint, differences between working in projects and working in operations, project success and failure, tasks of a project manager, project organisation forms, forms of project lifecycle, activities at project start, project management core processes (planning, project start, project execution, project controlling, project closing), supporting and facilitating processes.

	Methods of classical project management: Project proposal, Product Breakdown Structure (PBS), Work Breakdown Structure (WBS), Work Package Descriptions (WPD), Project Network Diagram (PND) (activity sequencing), Project schedule, effort and duration estimation, Organisational Breakdown Structure (OBS), Responsibility Assignment Matrix (RAM), resources plan, resources optimization, cost structure plan, project budget plan, introduction to Discounted Cash Flow (DCF) techniques (Net Present Value (NPV), Internal Return Rate (IRR))
Textbooks:	Fundamentals - Meredith, Jack; Mantel, Samuel: 'Project Management – A Managerial Approach', 9th ed. (International Student Version), Wiley, 2015 - Jenny, Bruno: 'Projektmanagement', vdf Hochschulverlag, Zürich 2005 Additional: - Kerzner, Harold: 'Project Management: A Systems Approach to Planning, Scheduling, and Controlling ', John Wiley & Sons; 12th Ed. (2017) - Basiszertifikat im Projektmanagement (GPM) GPM Deutsch Gesellschaft für Projektmanagement / Michael Gessler (Hrsg.)GPM Deutsche Gesellschaft für Projektmanagement e.V., 2010, ISBN: 9783942660136, 854 Seiten 3. Auflage
Assessment	Graded: Written exam

Project Budgeting and Controlling	
Study Program **Study level and semester**	International Project Engineering Bachelor, 3rd Semester
ECTS Credits	5
Hours per week / **total contact hours**	4 / 60
Total hours of study	150
Type/Teaching Method	Lecture, case studies, group tasks, e-learning
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr. Antje Brüsch E-Mail: Antje.Bruesch@Reutlingen-University.DE
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course
Prerequisites:	
Course learning objectives:	After course completion, students: Professional competencies ▪ can deduce a cost baseline. ▪ are able to use and adapt techniques for cost and risk analysis. ▪ are able to develop a budget. ▪ are able to define recovery measures. ▪ are able to define the structure of a multi project. Methodological competencies ▪ are able to understand the needs of multi project and single project control. ▪ are able to apply the methods used in multi and single project control. ▪ are able to forecast future trends. ▪ are able to structure and plan projects. ▪ are able to estimate the effort to reach project targets. Social competencies ▪ are able to report (interim) results, according to the needs of information addressees. International competencies ▪ improved their English writing skills with group tasks and case studies.
Contents:	Empirical surveys show, that: ▪ 20% of all IT-Projects will be cancelled ▪ Every second project will overrun time and / or will be more expensive ▪ Probability of failures rise with duration time and complexity!

	The course deals with the challenge, to define a proper baseline for a project and deduce (based on that baseline) a realistic budget as benchmark for the following controlling process. Therefore, students should reach the capability to define a proper baseline (plan), control complex projects and provide appropriate information to decision makers during the project. Overall, students should understand the necessity of project budgeting and controlling and learn to consider the management accountant as their "partner" in order to support the decision making throughout the project on all hierarchical levels
Textbooks:	Fiedler, R., aktuelle Auflage. Controlling von Projekten, Vieweg Verlag. Horngren, C.T. et al., current edition. Introduction to Management Accounting, Pearson. Kerzner, H., current edition. Project Management: A Systems Approach to Planning, Scheduling, and Controlling, John Wiley & Sons. Various articles
Assessment	Graded: Written exam (2hrs)

International Investment and Finance	
Study Program **Study level and semester**	International Project Engineering Bachelor, 2nd Semester
ECTS Credits	2
Hours per week / **total contact hours**	2 / 30
Total hours of study	60
Type/Teaching Method	Lecture, case studies, group tasks
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr. Antje Brüsch E-Mail: Antje.Bruesch@Reutlingen-University.DE
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course
Prerequisites:	
Course learning objectives:	At the end of the course students should: Professional competencies • be able to make decisions related to investments / evaluate, which alternatives are the best from an economic perspective (regarding investment). • be able to discuss and evaluate the pros and cons of different financing alternatives and decide which one is the best, regarding the specific financial circumstances of a company. • have understood basic concepts of investment appraisal and corporate finance and apply them in real-life situations. Methodological competencies • be trained in analytical and methodical competences, related to investment decisions based on the circumstances a company is facing. • be qualified to define targets, plan investments and the associated financing and therefore select appropriate methods, measures and tools. Social competencies • learned to deal with each other and develop respect for one another through group discussions and practical exercises in teams. International competencies • Improved their English language skills in the area of investment and finance.
Contents:	For their operations, a company needs assets, which have to be financed. Financial resources could be given by equity and/or debt investors.

	The course deals with the challenge of a company to meet the expectations of investors. Therefore, the planning and calculation of financial resources of a company is key in the investment field. The funding of these needs is the basis for the finance part of the course. The focus in this area is on the possibilities of internal and external financing as well as equity and debt financing.
Textbooks:	Brealey, R, Myers, S, Allen, F, current edition. Principles of Corporate Finance, McGraw Hill. Zantow, R., aktuelle Auflage. Finanzierung: Die Grundlagen modernen Finanzmanagements, Pearson Studium. various articles
Assessment	Graded: Written exam (1hr)

Managerial Accounting and Finance	
Study Program **Study level and semester**	International Project Engineering Bachelor, 2nd Semester
ECTS Credits	3
Hours per week / **total contact hours**	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture, case studies
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr. Antje Brüsch E-Mail: Antje.Bruesch@Reutlingen-University.DE
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course
Prerequisites:	Fundamentals of business administration
Course learning objectives:	At the end of the course students should: Professional competencies • have understood the holistic accounting system and should be able to explain the reasons / needs for the different segments of accounting. • be able to use the appropriate measure or method in specific circumstances and can explain the impact on the financial figures of a company. Methodological competencies • be trained in analytical, methodical and economical competences, related to accounting in general. • be qualified to define the required financial information in specific situations and should be able to evaluate the financial health of a company and deduce a clear statement. Social competencies • learned to deal with each other and develop respect for one another through group discussions and practical exercises in teams. International competencies • Improved their English language skills in the area of managerial accounting.
Contents:	Today, accounting is called 'language of business'. The course deals with the challenge of a company to record and report the appropriate information depending on different information addressees (Shareholder, Stakeholder, Manager, etc.). Therefore, the course deals with four segments of accounting:

	• double entry accounting • cost accounting • planning and shows relationships between these aspects.
Textbooks:	Taschner, A., Charifzadeh, M., aktuelle Auflage. Management and Cost Accounting, Wiley. Olfert, K., aktuelle Auflage. Kostenrechnung, Kiehl. various articles
Assessment	Graded: Written exam (1hr)

Computer Science for Engineers	
Study Program **Study level and semester**	International Project Engineering Bachelor, 3rd Semester
ECTS Credits	6
Hours per week / total contact hours	4 / 60
Total hours of study	180
Type/Teaching Method	Lecture, exercises, e-Learning, group work, presentations
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Mr. Danner
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course
Prerequisites:	This course is project based and requires continuous active participation throughout the semester (180 h workload)! Project work is assessed.
Course learning objectives:	After course completion, students: <u>Professional competencies</u> Know how to split a software development assignment into logical subtasks according to a software project management approach Are able to discuss the requirements for a software development Are able to structure and design software according to the norms Are able to implement, edit, test and eliminate errors in smaller programs with elementary data types, loops, and branches Are able to implement sensors and actuators with an embedded platform <u>Methodological competencies</u> Are able plan, steer and carry out a software development project as part of a team with experts and stakeholders Are able to structure complex tasks by an agile project management method <u>Social/Personal/International competencies</u> Are able to communicate with team members and experts about the contents and process of software design project. Are able to structure, report on and present complex tasks and (interim) results according to the needs of information addressees. Are able to identify and acquire missing information, research and transfer existing solutions to a given problem from online / international sources
Contents:	Evolutionary and agile project process models Planning and budgeting of software projects Project goals and requirements engineering

	Procedural and object oriented software development Modelling software by Nassi-Shneiderman diagrams and UML Software implementation in Python Testing of software, error types and software maturity levels Sensors and actuators Project assignment: Programming of a robot Documentation and presentation of the results
Textbooks:	Oesterreich, Bernd and Scheithauer, Axel. Die UML-Kurzreferenz 2.5 für die Praxis, 6. Auflage. Oldenbourg Wissenschaftsverlag, München, 2014. ISBN: 978-3-486-74909-0. Krypczyk, Veikko. Softwareentwicklungsprozess. Software & Support Media GmbH, 2013. ISBN: 978-3-86802-454-8. Tremp, Hansruedi. Lehrbuch Requirements Engineering Teil 1. BoD, Noderstedt, 2017. ISBN: 978-3-7448-2055-4.
Assessment	Project work PA

Quality Management Systems	
Study Program **Study level and semester**	International Project Engineering Bachelor, 4th Semester
ECTS Credits	3
Hours per week / **total contact hours**	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture (70%) plus integrated assignments (30%)
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Mr. Herbert Koch E-Mail: herbert.koch@Reutlingen-University.DE
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course.
Prerequisites:	
Course learning objectives:	After course completion, students: Professional competencies - will have acquired the content and the principles of modern Quality Management Systems, such as the DIN EN ISO 9000 industrial standard, ISO /TS16949 and are able to explain the background including the history. - can explain the PDCA (Plan-Do-Check-Act) performance management cycle. - recognize the principles of the quality-based organisation and of customer-centric thinking. - can explain important basic quality management methods and tools (e.g. 8D reporting, quality control cards, Root-Cause Analysis) and are able to apply these tools to practical problems. - know the principles of advanced quality management methods, such as the FMEA, Six Sigma, and Quality Function Deployment. Methodological competencies - know the tasks and responsibilities of quality management in different functions of an enterprise. - recognize that there is a correlation of professional quality management with economical benefits and future business orientation of a company. Social competencies - can resolve barriers regarding change management for process and product related improvement in an existing environment.

Contents:	Quality Management Standards Quality and Aspects of Law Quality and Economics Content Quality Management Quality Tools and Methods Quality Management in Product Development Quality Management in Procurement Quality Management in Production Quality Management in Use Phase of Products
Textbooks:	Gitlow, H.S.: Quality Management Systems: A Practical Guide, crc Press, 2001. Savsar, M. ed.: Quality Assurance and Management, 2012. Linß, G.: Qualitätsmanagement für Ingenieure, Hanser Verlag. ISO 9000:2005 Quality Management Systems – Principles amd Terms. ISO/TS16949 Qualitätsmanagementsystem für Automobilindustrie, Zulieferer. ZVEI Guideline Zero Defects - Zentralverband Elektroingenieure Deutschland. ZVEI Guideline Robustness Validation. Handouts, Videos
Assessment	Graded: Written exam (2 hrs.)

Scientific Methods	
Study Program **Study level and semester**	International Project Engineering Bachelor, 5th semester
ECTS Credits	2
Hours per week / total contact hours	2 / 30
Total hours of study	60
Type/Teaching Method	E-Learning course
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	N. N.
Restrictions	
Prerequisites:	This course requires a weekly continuous active participation throughout the whole semester! Participation is continuously assessed.
Course learning objectives:	This course will introduce you to reading and writing scientific work and its underlying scientific principles and methods. The goals is to support you in finding, collecting, classifying and interpreting existing scientific papers as well as to practice writing own pieces, presenting your work and putting your results critically into perspective. These are required competences for writing lab reports, documenting your international practical internship or writing your bachelor thesis as well as your future professional career. The course is suitable for students of any semester.
Contents:	The course is designed as a synchronous e-learning course accessible in Relax. e-learning means you can take this course anywhere where you have a computer and internet access, i.e. during your practical semester, from home or at university. Synchronous means the course is timed and every week you will be required to work through new material, research, read, write and submit a certain piece of writing. Despite the flexibility in location, you will extensively work with your peers by reviewing their work and discussing improvements. The examination method is continuous assessment; hence, you will only pass this course if you have made enough successful weekly submissions. Apart from professional and methodological competences, you will acquire life-long learning competencies with this course.
Textbooks:	
Assessment	Graded: Continuous Assessment (CA)

Smart Systems	
Study Program **Study level and semester**	International Project Engineering Bachelor, 6th semester
ECTS Credits	6
Hours per week / total contact hours	4 / 60
Total hours of study	180
Type/Teaching Method	Lecture, case studies, project assignment, group work and discussions
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	N. N.
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course.
Prerequisites:	This is an advanced course requiring: University Level Math (Algebra, Analysis, Trigonometry); Physics basics; Electrical Engineering basics; Computer Science (basic knowledge how to design, test and implement software in any language); Electrical drives; Control Engineering basics.
Course learning objectives:	At the end of the course students: <u>Professional competencies:</u> • are able to choose technical components for a smart system • have integrated a smart system and understand its limitations and challenges • can evaluate possible applications for smart systems, under consideration of legal, security, ethical and other questions <u>Methodological competencies</u> • can discuss the advantages and disadvantages of the application of new "smart" technology in various fields <u>Social/Personal competencies</u> • have designed and implemented a challenging technical design in a team
Contents:	<u>Technology:</u> Digital control and integration of microsystems, advanced mirco and nano technologies, deep learning, AI, neural networks, predictive analysis, virtual reality, connectivity, security, self-X-systems (learning, organizing, optimizing, repairing), blockchain, etc. <u>Applications</u>: Smart cities, IoT, smart traffic, smart society, digital business management, smart health, etc.

	Beyond: Ethics, legal aspects, business models, ecosystems for smart solutions, design thinking
Textbooks:	
Assessment	Graded: Exam (2 hrs.)

Management and Leadership	
Study Program **Study level and semester**	International Project Engineering Bachelor, 6th Semester
ECTS Credits	5
Hours per week / **total contact hours**	4 / 60
Total hours of study	150
Type/Teaching Method	Lecture, group work, presentations
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr. Kerstin Reich E-Mail: kerstin.reich@Reutlingen-University.DE
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course.
Prerequisites:	
Course learning objectives:	After course completion, students: Professional competencies - have dealt with complexities of global business issues. - have developed a critical understanding of the key concepts and principles of strategy, formulation and competitive analysis. - be able to apply theoretical knowledge to real-life situations. Methodological competencies - can name the basic concepts and terminology used in strategic management, analytical gained experience in using models analysing market entry decisions. - have gained knowledge in management coordination in a global business context. - can critically evaluate models and approaches in order to select the most appropriate strategy. Social competencies - be able to work in teams and give and receive feedback from the other team members. - be able to deal with controversial business situation, taking into account various interests of group members. Personal competencies - have developed decision making skills and understand one's own leadership style.

Contents:	Management Theory Corporate and business level strategy Leadership Motivation and Performance Conflict Management Communication
Textbooks:	Glasl, F. Konfliktmanagement, Haupt, newest edition Johnson, G., Scholes, K., Whittington, R. Fundamentals of Strategy, Pearson, newest edition Jones, G. R., George, J. M. Contemporary Management, McGraw Hill, newest edition Katzenbach, J. R., Smith, D. K. The Wisdom of Teams: Creating the High-performance Organization, Harvard Business School newest Koontz, H., Weihrich H. Essentials of Management, Tata McGraw-Hill, newest edition Mullins, L. Management and Organisational Behaviour, Prentice Hall, newest edition
Assessment	Graded: Written exam (2 hrs.) plus project assignments

Managing Human Resources	
Study Program **Study level and semester**	International Project Engineering Bachelor, 6th Semester
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture, role play, case study and group work
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr. Kerstin Reich E-Mail: kerstin.reich@Reutlingen-University.DE
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course.
Prerequisites:	
Course learning objectives:	After course completion, students: Professional competencies - have made acquaintance with basic theoretical foundations and cutting-edge challenges of HR. - be familiar with and have the ability to apply important tools and techniques of HR planning. - know how to deal with HR-related responsibilities in managerial positions and to conduct a selection processes. Methodological competencies - be able to manage plan and control key HR activities. - be able to contribute to company strategy by designing appropriate HR solutions; critically assess HR concepts and their limitations. Social competencies - be able to apply effective written and oral communication skills. - be able to work in diverse teams. - be able to give and receive feedback. - have understood dynamics in social systems such as organisations or teams. Personal competencies - have the awareness of one's personality and its relation to job requirements. - have understood how HR trends affect own employability and career planning.
Contents:	HRM: Past and Future War of talents, employer branding

	Selection process Performance appraisal Compensation policies Retention and resignation
Textbooks:	Cascio, W. F., Boudreau, J. W. Short Introduction to Strategic Human Resource Management, University Press newest edition. Dessler, G.) Human Resource Management, Pearson, newest edition. Torrington, D., Hall, L., Taylor, S. , Human Resource Management, Prentice Hall, newest edition.
Assessment	Graded: Written exam (1 h) plus project assignment

Cultural Change Management	
Study Program **Study level and semester**	International Project Engineering Bachelor, 6th Semester
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Mr. Martin Sattler E-Mail: martin.sattler@Reutlingen-University.DE
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course.
Prerequisites:	
Course learning objectives:	After course completion, students: Professional competencies - can explain and evaluate the elements of company culture (various models). - have the ability to plan change projects and define suitable controlling approaches for successful execution. Methodological competencies - are able to analyse existing organisational cultures using different cultural models. - can specify target cultures and select and design interventions to change an existing organisational culture into the selected target culture. - know that there could be resistance and know ways to overcome it. Social competencies/ Personal competencies - recognize that changes imply personal attitude and intrinsic motivation. - are capable to collaborate with other students (presentation skills, role play experience). - are able to identify different behaviour patterns of employees and colleagues during a change. The need for social competence is trained in this lecture. International competencies - can look at change management in different countries (e.g. Brazil or Jordan) and reflect cultural diversity with the support of foreign exchange students.
Contents:	Understanding culture; Models of organisational cultures CHANGE ANALYSIS - Change Context Analysis: Scope, Time, Investment, Targets, Resistance, etc. - Cultural Analysis: Analysis of the initial and the target culture.

	- Stakeholder Analysis: Analysis of interest and power of the affected parties CHANGE DESIGN - Change Path: Nature of the change and desired result (adaption vs. „big bang“) - Change Starting Point: Where the change is initiated (top-down vs. bottom-up) - Change Levers: Cultural elements to be targeted (artifacts, behavior, values, etc.) CHANGE EXECUTION - Change Leadership: Organize leadership engagement. - Change Sequence: Detailed planning of change steps and communication. - Change Communication: Creation of the communication content. - Change Project Management and Change Project Controlling
Textbooks:	Balogun, Julia; Hope Hailey, Veronica, ‘Exploring Strategic Change’, Prentice Hall, newest edition Additional reading: Kotter, John P., Cohen, Dan S.: The Heart of Change: Real-Life Stories of How People Change Their Organizations, Macmillan, newest edition. Kotter, John, Duck, Jeanie Daniel: Change Management - Strategies for Realizing change, Harvard Business School Publishing, newest edition.
Assessment	Graded: Written exam

Project Management Certification	
Study Program **Study level and semester**	International Project Engineering Bachelor, 6th Semester
ECTS Credits	2
Hours per week / total contact hours	2 / 30
Total hours of study	60
Type/Teaching Method	Seminar-style Lecture. Taught as compact course on 3-4 selected dates!
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Mr. Erik Lehman E-Mail: Erik.Lehmann@Reutlingen-University.DE
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course.
Prerequisites:	
Course learning objectives:	After course completion: Professional competencies - know the work processes in IPMA-Standard - are able to plan and initiate a project - can create transparency for the project participants - can control and evaluate the progress of the project - are able to steer the change management process in projects - furthermore, students have the knowledge to successfully pass the “GPM Basiszertifikat” (i.e. an nationally recognized professional IPMA Project Management Certificate).
Contents:	ICB 3.0 Competence Elements Project management success Interested parties Project requirements & objectives Risk & opportunity Quality Project organisation Teamwork Problem resolution Project structures Scope & deliverables Time & project phases Resources Cost & finance

	Procurement & contract Changes – Control & reports Information & documentation Communication Start-up Close-out / PM behavioral competencies
Textbooks:	Lecture notes in English
Assessment	Graded: Written exam

Project Management Simulation	
Study Program **Study level and semester**	International Project Engineering Bachelor, 6th Semester
ECTS Credits	2
Hours per week / total contact hours	2 / 30
Total hours of study	60
Type/Teaching Method	Laboratory internship. Taught as compact course on 3-4 selected dates!
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course.
Prerequisites:	
Course learning objectives:	After the completion of the course, students: Professional competencies - are able to estimate the "duration, cost and degree of completion" of practical oriented case studies. - are able to take advantage of project-based learning and modern project management software in the planning, organisation, budgeting and resource assignment of complex projects. - are able to perform project monitoring, project control and project optimization. - are able to execute independently activities in the project management of complex Projects Methodological competencies - are able to generate technical reports. - Social competencies/International competencies - are able to use business English in project management. - Personal competencies - are able to set their own deadlines and to evaluate the progress towards the given goals.
Contents:	Principles and limitations of professional project planning software. Computer-based project plan, budgeting, resource assignment. Computer-based project monitoring, project control and project optimization. Reporting in the engineering and in the project management: □ Gantt Chart and Project Network Diagrams Milestone plans, timelines and tables of activities technical reporting

Textbooks:	HOLERT, H. (2011). Microsoft Project 2010 – Das Profibuch. Microsoft Press Deutschland. ISBN: 978-3866454484. CHATFIELD, C., JOHNSON, T. (2010). Step by Step – Microsoft Project 2010. Microsoft Press. ISBN: 978-0735626959. The mouse training company. Microsoft Project 2010 Training – Project quick reference card. Available from the company site. Last retrieved: 04.09.2012. http://www.mousetraining.co.uk/training-manuals/Project_2010_QRG.pdf
Assessment	Graded: Computer Lab Assignments, Attestation

Control Engineering	
Study Program Study level and semester	International Project Engineering Bachelor, 6th Semester
ECTS Credits	5
Hours per week / total contact hours	4 / 60
Total hours of study	150
Type/Teaching Method	Lecture
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	N. N.
Restrictions	Only in combination with Control Engineering Lab (6 ECTS – 180 hours workload in total!). Only 5-6 international Students at the maximum can be admitted to this course.
Prerequisites:	This is an advanced course requiring: University Level Math (Algebra, Analysis, Trigonometry); Physics basics; Electrical Engineering basics; Computer Science (basic knowledge how to design, test and implement software in any language); Electrical drives; Engineering mechanics. Computer access required (own laptop or computer lab on campus).
Course learning objectives:	Students are able to derive transfer functions of simple dynamic systems and can name their behavior in the time as well as in the frequency domain. They are able to derive mathematical models of control elements and control circuitries. The students are able to optimize a simple control setup regarding its stationary and dynamic behavior.
Contents:	Analog and digital conversion, dynamic of linear, time invariant systems as well as their documentation through Laplace transformation and transfer functions, structure of open and closed loop control circuits, derivation of transfer functions of simple control setups, stabilization and optimization of simple control circuits, modelling of control tasks
Textbooks:	Dally, James W., Riley, William F. und McConnel, Kenneth G., Instrumentation for Engineering Measurements, Danvers: John Wiley & Sons, Inc., 1993. ISBN 0-471-55192-9. de Silva, Clarence W. Sensors and Actuators, Boca Raton: Taylor & Francis Group, 2007. ISBN-10: 1-4200-4483-4. Dorf, Richard C. und Bishop, Robert H. Modern Control systems, London: Pearson Education Ltd., 2005. ISBN 0-13-127765-0
Assessment	Graded: Written exam (2hrs.)

Control Engineering Laboratory	
Study Program Study level and semester	International Project Engineering Bachelor, 6th Semester
ECTS Credits	1
Hours per week / total contact hours	2 / 30
Total hours of study	60
Type/Teaching Method	Laboratory
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	N. N.
Restrictions	Only in combination with Control Engineering (6 ECTS – 180 hours workload in total!). Only 5-6 international Students at the maximum can be admitted to this course.
Prerequisites:	This is an advanced course requiring: University Level Math (Algebra, Analysis, Trigonometry); Physics basics; Electrical Engineering basics; Computer Science (basic knowledge how to design, test and implement software in any language); Electrical drives; Engineering mechanics. Computer access required (own laptop or computer lab on campus).
Course learning objectives:	During the lab, students learn and exercise how to analyze, model and solve a more complex control task autonomously.
Contents:	Analysis and mathematical description and modelling of a given technical system, derivation of a simulation model from the mathematical model, programming of the model in MatLab Simulink, design and modelling of a controller, optimization of the controller
Textbooks:	Dally, James W., Riley, William F. und McConnel, Kenneth G., Instrumentation for Engineering Measurements, Danvers: John Wiley & Sons, Inc., 1993. ISBN 0-471-55192-9. de Silva, Clarence W. Sensors and Actuators, Boca Raton: Taylor & Francis Group, 2007. ISBN-10: 1-4200-4483-4. Dorf, Richard C. und Bishop, Robert H. Modern Control systems, London: Pearson Education Ltd., 2005. ISBN 0-13-127765-0
Assessment	Ungraded: Lab report

Plant Engineering	
Study Program **Study level and semester**	International Project Engineering Bachelor, 4th Semester
ECTS Credits	6
Hours per week / total contact hours	4 / 60
Total hours of study	180
Type/Teaching Method	Lecture (70%) with integrated exercises (30%)
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr.-Ing. Georg Samland E-Mail: Georg.Samland@Reutlingen-University.DE
Restrictions	
Prerequisites:	
Course learning objectives:	After the completion of the course, students: Professional competencies - know the components used in typical plants. - are able to read and interpret P&ID-diagrams - are able to discuss plant-engineering problems. - are aware of HAZOP-studies and SIL-categories. - are able to calculate and size typical piping configurations. Methodological competencies - have fundamental knowledge in plant engineering and they are able to discuss safety issues. - They have the competency to lead a discussion and to make decisions in a plant engineering project. Personal competencies - are able to make decisions on their own and they can set up appropriate documents.
Contents:	Scaling and cost estimation of plants Safety Issues and HAZOP-Studies Block-diagram, flow-diagram, P&ID Diagram, Main components (Motor, compressors, pumps, piping, heat exchanger, instrumentation…) Measurement devices for e.g. mass flow, temperature, velocity, vibration… Sizing of pipes
Textbooks:	
Assessment	Written final exam (2 hours)

Product and Innovation Management	
Study Program **Study level and semester**	International Project Engineering Bachelor, 7th Semester
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture, case studies, group tasks
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Dr. Brigitte Pihulak E-Mail: brigitte.pihulak@Reutlingen-University.DE
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course.
Prerequisites:	
Course learning objectives:	After course completion, students: Professional competencies - have understood the difference between invention, innovation, product and innovation management; apply basic innovation and product management concepts in international business situations. Methodological competencies - will be able to use the appropriate measure or method in specific circumstances and can explain the innovations of a company. - will be trained in analytical, methodical and economical competences, related to product and innovation management in general. - will be educated to debate mega trends and trends and their impact for innovation and product management and should be able to evaluate the type(s) of innovations of a company and deduce a clear statement. Social and personal competencies - will have refined oral communication skills; improve ability to work in teams in order to solve a given complex innovation and product management situation. - International competencies - will have experienced the challenges of international innovation and product management in terms of cultural differences. Critically analyze and discuss implications of real life situations related to innovation and product management.
Contents:	Innovation and product management: The course deals with the challenge of a company to continuously position their products successfully on the markets. Therefore the course focus is on six segments of product and innovation management:

	- Future and trends - Strategies - Product development - Product management - Innovation processes and management - Innovation culture - and shows relationships between these aspects.
Textbooks:	Malik / Robers / Horx / Micic / Minx / EBS / Product and Innovation strategy Daimler Chrysler Sparte VAN 2000 - 2002 various arcticles
Assessment	Graded: Written exam

Intercultural Communication, Presentation	
Study Program **Study level and semester**	International Project Engineering Bachelor, 7th Semester
ECTS Credits	5
Hours per week / total contact hours	4 / 60
Total hours of study	150
Type/Teaching Method	Presentation, case studies, discussions, group work
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr. Kerstin Reich E-Mail: kerstin.reich@Reutlingen-University.DE
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course.
Prerequisites:	
Course learning objectives:	After successful completion, students: Professional competencies - have understood the scope of different cultural models and have the ability to transfer and - apply theoretical knowledge to real-life settings. - have achieved a deeper understanding of cultural differences (e.g. national, regional but - also on group level). - have achieved the competences in leading international teams, negotiating strategies and - business behavior. Methodological competencies - can analyse case studies and critical incidents in an intercultural context. - can apply cultural dimensions and theoretical background to real-life settings. Social competencies/ International competencies - have awareness of different values and cultural imprinting. - have a set of tools in order to react in a flexible way in cultural situations. - improved oral and written communication skills. - can give and receive feedback from fellow students in a structured and constructive manner. Personal competencies - have awareness of one's own personality and its relation to other cultures, understand one's own personality and its implications to teamwork.

Contents:	Overview of main intercultural management concepts and approaches Verbal and non-verbal communication concepts Training individual intercultural competences Self-assessment
Textbooks:	Browaeys, M.-J., Price, R. Understanding Cross-Cultural Management, FT Press, newest edition. Hall, E.T., Hall M. R. (1990) Understanding Cultural Differences, Yarmouth: Intercultural Press. Hofstede, G., Hofstede, G. J. Cultures and Organisations – Software of the Mind, Mcgraw-Hill Professional, newest edition. Rothlauf, J., A Global View on Intercultural Management: Challenges in a Globalized World. Verlag De Gruyter Studium, newest edition. Trompenaars, F., Hampden-Turner, C. Riding the Waves of Culture: Understanding Cultural Diversity in Business, Nicholas Brealey Publishing, newest edition.
Assessment	Graded: Written seminar paper (70%), group presentations (30%)

Information Management	
Study Program **Study level and semester**	International Project Engineering Bachelor, 7th Semester
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture, case studies, group tasks, e-learning
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr. Antje Brüsch E-Mail: Antje.Bruesch@Reutlingen-University.DE
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course.
Prerequisites:	
Course learning objectives:	At the end of the course students should: Professional competencies ▪ have understood the challenge of information needs of managers in a global world. ▪ be able to describe the theoretical basics of information management. ▪ be able to analyze the specific situation of a company by using the appropriate Techniques and methods. ▪ be able to discuss the pros and cons of current state of the art technology associated with ▪ Information Management (IM) / Information Technology (IT). ▪ Methodological competencies ▪ are able to use tools of digital collaboration and to present online ▪ Social and personal competencies ▪ have refined oral communication skills ▪ have improved the ability to work in teams in order to propose strategies for a digital world. International competencies ▪ have improved their English discussion and writing skills with group tasks.
Contents:	The students learn in this class what the main challenges of digitalisation are from a business perspective and how to prepare for these challenges.
Textbooks:	Rainer, R. K, Prince, B, current edition. Introduction to Information Systems – Supporting and transforming business, Wiley. Krcmar, H., aktuelle Auflage. Informationsmanagement, SpringerGabler. various articles
Assessment	Graded: Written exam (1h) and group task

Supply Chain Management	
Study Program **Study level and semester**	International Project Engineering Bachelor
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Project work, simulation game
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr. Antje Brüsch E-Mail: Antje.Bruesch@Reutlingen-University.DE
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course.
Prerequisites:	
Course learning objectives:	
Contents:	This course will introduce you to the overall topic of supply chain management. The simulation is mainly based on the ideas of the lean principles and the Toyota Production System (TPS). The goals is to support you in building your proper “lean mindset” for working in production, in presenting appropriately indicators from the production environment and in working on further problems dealing with supply chains. These are required competencies for many internships as well as your future professional career. The course is suitable for students of any semester. Two thirds of the course are designed as an on-site simulation game – performed during two entire days. The additional case work will be distributed across the semester and will be graded. Further presentations (guest lecturers) or visits (Lernfabrik Reutlingen Werk 150, OEMs) will complement the programme and add to the practical application of this subject. The examination method is the mandatory participation in a two day simulation (attendance) and a project report including presentation about a case study. Apart from professional and methodological competences, you will acquire the appropriate mindset for working in or close to production areas. The number of participants is supposed to be superior to 6-8 students (or more) in order for the simulation to make sense.
Textbooks:	
Assessment	Graded: Project report, participation in simulation game (presentation)

Mechanical Engineering Bachelor

Heat Transfer	
Study Program **Study level and semester**	Mechanical Engineering Bachelor
ECTS Credits	6
Hours per week / total contact hours	4 / 60
Total hours of study	180
Type/Teaching Method	Lecture
Language of instruction	English
Frequency	Winter Semester
Course Coordinator/Instructor	Prof. Dr.-Ing. Bernd Thomas E-Mail: bernd.thomas@reutlingen-university.de
Restrictions	The course is designed for students from the following partner universities: Valparaiso University, Kettering University, NC State University. **A minimum number of 5 international students** is required for offering the course in English. As tailored for students from the aforesaid Universities, the language of instruction is English until the exam for the international students in mid-December (Chapter 1-5). For the remaining lessons thereafter, which are assigned to Chapter 6, the language of instruction will be German.
Prerequisites:	Basic Math skills
Course learning objectives:	The objective of this course is to provide an insight into heat transfer problems. Topics covered include heat transfer by conduction, both multi-dimensional and non-stationary; convection and radiation; the design of heat exchangers. The focus is on the transformation of the physical problems into appropriate mathematical equations, in order to achieve the desired results.
Contents:	1. Fundamentals 2. Thermal Conduction 2.1 Steady-state, 1-dimensional conduction, Integral approach 2.2 Transient, 1-dimensional conduction 3. Convection 3.1 Thermal boundary layer and heat transfer coefficient 3.2 Heat transfer correlations in case of forced convection 3.4 Heat transfer correlations in case of free (natural) convection 4. Thermal radiation 5. Overall heat transfer, heat exchangers 5.1 The overall heat transfer coefficient 5.2 Heat exchangers 5.3 Fined surfaces 6. Thermal conduction, differential approach

	6.1 Steady-state, 1-dimensional conduction 6.2 Steady-state, 1-dimensional conduction incl. internal heat generation 6.3 Steady-state, 2 and 3-dimensional conduction 6.4 The transient differential equation
Textbooks:	F.P. Incropera, D.P. DeWitt, T.L. Bergmann, A.S. Lavine Introduction to Heat Transfer John Wiley & Sons, 6th ed., 2011 T.L. Bergmann Fundamentals of Heat and Mass Transfer John Wiley & Sons Inc, 8th ed., 2016
Assessment	Graded: Written exam, 2 hours

Design Methodology	
Study Program **Study level and semester**	Mechanical Engineering Bachelor, 4th Semester
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr.-Ing. Steffen Ritter E-Mail: Steffen.Ritter@Reutlingen-University.DE
Restrictions	None
Prerequisites:	Engineering Design Basics (~ 400 class)
Course learning objectives:	Methodology of technical problem solution esp. product development, analysis, evaluation and selection of design alternatives
Contents:	The course covers the methodology for engineering development projects- Students will learn “tool” by “tool” the essentials of a correct and ideal product development process on a base of systematic solution finding. A. Introduction B. General Tools C. Design Process VDI 2221 D. Product Specification E. Systematic Idea Finding F Problem Abstraction G. Physical Working Principles H. Concept Selection I. Design Objectives K. Eco Design
Textbooks:	All handouts will be provided by the professor
Assessment	Graded: Project and presentation/oral exam

Rapid Product Development	
Study Program **Study level and semester**	Mechanical Engineering Bachelor 6th Semester
ECTS Credits	3 ECTS Credits
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr.-Ing. Michael Lauxmann E-Mail: michael.lauxmann@reutlingen-university.de
Restrictions	None
Prerequisites:	Strength Analysis
Course learning objectives:	Strength Analysis of simple mechanical designs with the help of Creo Simulate (FEM Code)
Contents:	RPD deals with the analysis of structures subject to mechanical and thermal loads. Starting from CAD-Models we learn how to perform a static or dynamic FEM analysis, use the most often available tools and try to interpret the results. Topics such as boundary conditions and singularities, sensitivity and optimization analysis, screw and welded joints are covered. There are lectures where short presentations introduce the problems and labs where the students work on these problems.
Textbooks:	Creo Simulate 3.0 Tutorial, Roger Toogood
Assessment	Graded: Students are supposed to give presentations in the lectures and perform a group project.

Applied Accoustics	
Study Program **Study level and semester**	Mechanical Engineering, Mechatronics, International Project Engineering Bachelor
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture, experiments, project task
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr.-Ing. Stephan Pitsch E-Mail: Stephan.Pitsch@Reutlingen-University.DE
Restrictions	None
Prerequisites:	Mathematics (analysis, differential equations, Fourier series, complex numbers) Physics (mechanics, oscillations) Programming experience (MATLAB)
Course learning objectives:	In this course, participants learn about fundamentals of acoustics, perform sound and frequency band analysis, use professional acoustic measurement equipment in order to determine acoustical quantities or design a reflection absorber (muffler).
Contents:	Fundamentals of acoustics (1st half of the term, obligatory) ▪ Sound and its properties ▪ Acoustical quantities (sound pressure, particle velocity, sound power, etc.) ▪ Level calculation ▪ Perception of sound ▪ Sound sources and resonators ▪ Sound propagation ▪ Sound measurement and analysis Project tasks (2nd half of the term, elective) (participants choose one of the following projects) ▪ Project 1: Sound power measurement (DIN 3744) ▪ Project 2: Room acoustical planning (DIN 18041) ▪ Project 3: Reflection absorber design
Textbooks:	Lawrence Kinsler, A. F. (2000). Fundamentals of Acoustics. John Wiley & Sons.
Assessment	Graded: Written exam

Mechanical Engineering Master

Numerical Analysis	
Study Program Study level and semester	Mechanical Engineering Master, 1st Semester
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture
Language of instruction	English or German (depending on the demands of the participants)
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr. rer. nat. Barbara Priwitzer E-Mail: barbara.priwitzer@reutlingen-university.de
Restrictions	None
Prerequisites:	Basic courses in Mathematics, especially: ▪ basic analysis of functions of one and several variables ▪ theory of ordinary differential equations (ODEs) ▪ linear algebra
Course learning objectives:	▪ Awareness of the problems that can arise when solving mathematical problems numerically. ▪ Knowledge of basic algorithms for the classical tasks in numerical analysis (solving equations, integration, …). ▪ Assessing the quality of numerical solutions. ▪ Improving programming skills.
Contents:	▪ Floating point arithmetic ▪ Conditioning of numerical problems ▪ Direct and iterative methods for solving systems of linear equations ▪ Polynomial and Spline interpolation ▪ Numerical solution of initial value problems in ordinary differential equations
Textbooks:	▪ Gisela Engeln-Müllges/ Klaus Niederdrenk/ Reinhard Wodicka: Numerik-Algorithmen, 10. Auflage, Springer 2010 ▪ E. Süli/ D.F. Mayers:An introduction to numerical analysis, Cambridge University Press, 2003 ▪ Masayuki Yano/ James Douglas Penn/ George Konidaris/ Anthony T Patera: Maths, Numerics and Programming for Mechanical Engineers, MIT Open Course Ware 2013
Assessment	Graded: one assignment + written exam (60 min)

Partial Differential Equations	
Study Program **Study level and semester**	Mechanical Engineering Master, 1st Semester
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Dr. rer.nat. Reinhard Honegger E-Mail: reinhard.honegger@reutlingen-university.de
Restrictions	None
Prerequisites:	Ground courses 1 and 2 in Mathematics. Especially, the analysis of functions of several variables, and the theory of ordinary differential equations (ODEs) of first and second order.
Course learning objectives:	Beside an interpretational appreciation, we learn in the course how to solve - mostly analytically but also numerically (with finite differences) - the basic types of linear homogeneous PDEs with two variables: transport equations, the wave equation, the diffusion or heat flow PDE, and the Laplace equation.
Contents:	The fundamental understanding of the physical world around us, but also of many technical, biological, chemical, economical, or even social processes is based on partial differential equations (PDEs). Main examples are the vibrations of strings and solids, the flow of fluids, the diffusion of chemicals, the spread of heat, the structure of molecules, the emission of photons from atoms, molecules, or superconductors, and the radiation by electromagnetic waves. The lecture is divided into three parts: theory, examples, and the discussion of exercises you have done as homework.
Textbooks:	
Assessment	Graded: There is one assignment and a written exam (60 min)

Numerical Structural Mechanics	
Study Program **Study level and semester**	Mechanical Engineering Master, 2nd Semester
ECTS Credits	7
Hours per week / total contact hours	6 / 90
Total hours of study	210
Type/Teaching Method	Lecture and laboratory assignments
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr.-Ing. Michael Lauxmann E-Mail: michael.lauxmann@reutlingen-university.de
Restrictions	Only taught in English if demanded by 3 international students at the minimum
Prerequisites:	Numeric, Partial Differential Equations
Course learning objectives:	Getting to know the basics of the multibody and finite element method in terms of their theoretical principles and their practical use.-
Contents:	The course starts with an introduction on different modelling technics. It considers various aspects of multibody system dynamics including the theoretical basics of kinematics and kinetics as well as principles of mechanics. Later on an introduction in finite element systems follows, focusing on static and basic transient stress analysis applications. By means of examples out of the field of mechanical engineering, special focus is given on dynamical phenomena. Lectures and exercises alternate in an adequate manner to complete the understanding of the topics. The exercises comprise both manual exercises on a piece of paper as well as computer–aided exercises in the simulation laboratories with the help of Matlab and Ansys.
Textbooks:	Technische Dynamik, Schiehlen, W. und Eberhard, P. ;
Assessment	Finite element procedures, Bathe, K.-J.

Basic Principles of Energy Conversion	
Study Program **Study level and semester**	Mechanical Engineering Master, 1st semester
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr.-Ing. Frank Truckenmüller E-Mail: Frank.Truckenmueller@Reutlingen-University.DE
Restrictions	Only taught in English if demanded by 3 international students at the minimum
Prerequisites:	Understanding of fundamentals of thermodynamics
Course learning objectives:	Understanding of the fundamentals of conversion of energy applied to different processes and option for improvement
Contents:	1.) Global energy consumption and future global development 2.) forms of energy and energy concepts and the theoretical foundations 3.) Energetic evaluation criteria; efficiency, energy-harvesting factor etc 4.) Apply the thermodynamic assessment criteria on combustion and associated cycles in thermal power plants; Steam turbine, gas turbine, combustion engines 5.) Energy Conversion at the examples of the pumped storage power plant and wind power 6.) Energy Conversion at the examples of the fuel cell and photovoltaic 7.) Energy Conversion examples of biogenic energy conversion 8.) Energy Conversion at the example of solar thermal Criteria for assessment of energy storage
Textbooks:	
Assessment	Graded: Project, presentation and exam

Mechatronics Bachelor

Communication Systems	
Study Program **Study level and semester**	Mechatronics Bachelor, 6th Semester
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture
Language of instruction	English
Frequency	Winter Semester
Course Coordinator/Instructor	Prof. Dr. Thorsten Zenner E-Mail: thorsten.zenner@reutlingen-university.de
Restrictions	
Prerequisites:	**One exam in electrical engineering or informatics (e. g. programming, SW-design)**
Course learning objectives:	Students will understand the main concepts in technical communication. They will know about state of the art technologies. They will be able to evaluate different communication technologies according to specific applications.
Contents:	Basics of communication technologies, ISO/OSI- Reference-model, TCP/IP reference model. Physical layer: Bandwidth, Nyquist-theorem, Shannon-theorem, serial communication, coding, Modulation, multiplexing. Link layer: Medium access, error detection, error correction TCP/IP Fieldbus: Profibus, CAN, Modbus Realtime-Ethernet: Ethercats
Textbooks:	Lecture notes in German are provided, Andrew Tanenbaum u. a.: Computer Networks, 5. Auflage, Pearson Education Limited, (2014)
Assessment	Graded: Written exam

Communication Systems Laboratory	
Study Program **Study level and semester**	Mechatronics Bachelor , 6th Semester
ECTS Credits	1
Hours per week / total contact hours	1 / 15
Total hours of study	30
Type/Teaching Method	Laboratory
Language of instruction	English
Frequency	Winter Semester
Course Coordinator/Instructor	Prof. Dr. Thorsten Zenner E-Mail: thorsten.zenner@reutlingen-university.de
Restrictions	Only in combination with lecture
Prerequisites:	
Course learning objectives:	Students will work in small groups on solutions for limited projects
Contents:	Lab assignments pertaining to the Communication Systems lecture
Textbooks:	Lecture notes in German are provided, Andrew Tanenbaum u. a.: Computer Networks, 5. Auflage, Pearson Education Limited, (2014)
Assessment	Ungraded: Documentation of laboratory work

PLC Control Systems	
Study Program **Study level and semester**	Mechatronics Bachelor , 4th Semester
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture
Language of instruction	English
Frequency	Winter Semester
Course Coordinator/Instructor	Prof. Dr. rer. nat. Prof. Dr. Thorsten Zenner E-Mail: thorsten.zenner@reutlingen-university.de
Restrictions	One successful exam in a lecture in programming
Prerequisites:	
Course learning objectives:	Students will learn to develop PLC-programs according the standard IEC61131. They will understand the main difference of operation of a PLC compared to other computer systems. They will be introduced to the basic concepts of object-oriented design and how to apply these to PLC-programming
Contents:	Definition of PLC IEC 61131, Elements of PLC-Programming, programming languages (IL, ST, FBS, LD and SFC), Use-cases, activity-charts, state-charts, Implementation of State-diagrams or Activity-Diagrams, Usage of standard libraries (Logic, Set/Rest-Function, Timer, Trigger, Counter, the Model-View-Control-Pattern,
Textbooks:	Lecture notes are only available in German
Assessment	Graded: Written exam

PLC Control Systems Laboratory	
Study Program **Study level and semester**	Mechatronics Bachelor , 4th Semester
ECTS Credits	2
Hours per week / total contact hours	2 / 30
Total hours of study	60
Type/Teaching Method	Laboratory
Language of instruction	English
Frequency	Winter Semester
Course Coordinator/Instructor	Prof. Dr. rer. nat. Prof. Dr. Thorsten Zenner E-Mail: thorsten.zenner@reutlingen-university.de
Restrictions	Only in combination with lecture
Prerequisites:	None
Course learning objectives:	Students will work in small groups on solutions for limited projects in the area of Automation
Contents:	Lab assignments pertaining to the PLC Control Systems lecture
Textbooks:	
Assessment	Ungraded: Documentation of laboratory work

Electrical Drives	
Study Program **Study level and semester**	Mechatronics Bachelor, 6th Semester
ECTS Credits	4
Hours per week / total contact hours	3 / 45
Total hours of study	120
Type/Teaching Method	Introductory lecture session. All following sessions will be taking place as tutorials and practical trainings in the laboratory
Language of instruction	Course materials, exam and lab assignments will be provided in English.
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr.-Ing. Gernot Schullerus E-Mail: gernot.schullerus@reutlingen-university.de
Restrictions	None
Prerequisites:	Mathematics Fundamentals of electrical engineering Principles of mechanics
Course learning objectives:	Students are familiar with the structure, the operating principles and the behaviour during operation of the following drive types: dc-machine induction machine permanent magnet synchronous machine brushless dc-motor stepper motor Students are able to choose and do the dimensioning for an electrical drive for a given application
Contents:	- Materials, standards and basic definitions - DC-machine - Rotating field machines - Brushless-DC motors - Stepper motors - Dimensioning of electrical drives
Textbooks:	Lecture notes are provided
Assessment	Graded: Written exam (1h)

Interactive Robots in Motion	
Study Program **Study level and semester**	Mechatronics Bachelor, 7th semester
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	60
Type/Teaching Method	Lectures, Practical Training and Projects
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr. rer. nat. Matthias Rätsch E-Mail: matthias.raetsch@reutlingen-university.de
Restrictions	
Prerequisites:	
Course learning objectives:	The students know the fundamentals of the interaction and collaboration of intelligent robots with humans in the times of industry 4.0 and the change from industrial robots to intelligent, autonomous and collaborative systems, which are one day hardly distinguishable from humans. Students appreciate that robots are getting faster, stronger and more intelligent and therefore why they are better at playing chess, Go and StarCraft II. Students will acquire knowledge and will be able to answer questions about AI and robotics, in areas such as: How and when is the Turing Test "applied"? Secrets of non-verbal interaction? Avatars in computer games and virtual worlds? How do Google Glass + Siri work and what can they be used for? Will robots be the better humans? Will they replace us in my future career? What means super intelligence, singularity and transhumanism? The students are familiar with current developments in the field of collaborative, intelligent robots, have initial experience in the practical use of these systems and can assess the effects on the areas of our life. An optional follow-up project can be selected to consolidate the learning objectives.
Contents:	- Basics of modern 3D sensor technology in mobile robotics. - Artificial intelligence for autonomous and collaborative robots. - Autonomous localization and navigation using monocular SLAM techniques. - Verbal and non-verbal interaction between robots and humans.

	- The use, impact and vision of the new generation of intelligence and robots. - Practical approach to interactive, mobile and collaborative robots, as well as SDKs. - Design and development of concepts, modules and prototypes for leading collaborative robots in industrial projects or for RC@Home. - if applicable, continuation of the successes of the world champion team.
Textbooks:	Lit. on Pattern Recognition and Machine Learning: e.g. by Christopher M. Bishop (ISBN-10: 0387310738, ISBN-13: 978-0387310732) Lit. on Swarm Intelligence/Image and Video Processing: e.g. publications by Prof. Matthias Rätsch at https://www.visir.org/people/ Lit. on Computer Vision and Robotics: e.g. "Robotics, Vision and Control" by Peter Corke (ISBN-10: 3642201431, ISBN-13: 978-3642201431) Lit. with philosophical background and visions about virtual and mixed reality future worlds: e.g. "Der futurologische Kongreß" by Stanislaw Lem, "Brave New World" by Aldous Huxley, "The Matrix" Triology by Andy and Larry Wachowski, "i,ROBOT" by Alex Proyas, "Bicentennial Man" by Chris Columbus, "Gottes Gehirn" by Jens Johler and Olaf-Axel Burow Lit. on SCITOS with MIRA support and sources, e.g.: Comparison MIRA vs. ROS: http://www.mira-project.org/MIRA-doc/ComparisonWithROSPage.html Projects from students (s. RELAX and http://projekte.rt-lions.de/SCITOS)
Assessment	Graded: Project work, documentation, presentation

Power Electronics Laboratory	
Study Program **Study level and semester**	Mechatronics Bachelor/6th Semester
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	60
Type/Teaching Method	Laboratory
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dipl.-Ing. Gernot Schullerus E-Mail: gernot.schullerus@reutlingen-university.de
Restrictions	
Prerequisites:	Fundamentals in Electrical Engineering, Power Electronics
Course learning objectives:	The students are able to start up circuits in the power electronics. They know the limits of the function from theoretical considerations and measurement results. They know the danger of high voltages and high currents. They are working with - The synchronous step up and step down converter - The design of coils, the fabrication and the measurement of the calculated values - Full bridge to control a DC-Motor - Measurements at a predesigned push pull converter - The switching behavior of a MOSFET - Driver circuits with pulse transformer
Contents:	The students are able to start up circuits in the power electronics. They know the limits of the function from theoretical considerations and measurement results. They know the danger of high voltages and high currents. They are working with - The synchronous step up and step down converter - The design of coils, the fabrication and the measurement of the calculated values - Full bridge to control a DC-Motor - Measurements at a predesigned push pull converter - The switching behavior of a MOSFET - Driver circuits with pulse transformer
Textbooks:	
Assessment	Ungraded: Documentation of laboratory work

Semiconductor Devices	
Study Program **Study level and semester**	Mechatronics Bachelor, 6th semester
ECTS Credits	4 ECTS Credits
Hours per week / total contact hours	6 / 60
Total hours of study	150
Type/Teaching Method	Lecture
Language of instruction	English
Frequency	Every semester
Course Coordinator/Instructor	Prof. Dr.-Ing. Ertugrul Sönmez E-Mail: ertugrul.soenmez@reutlingen-university.de
Restrictions (if applicable)	None
Prerequisites:	Fundamentals of electrical engineering and mathematics
Course learning objectives:	The students know the functionality of semiconductor devices based on the physical semiconductor properties. They are also familiar with models of semiconductor devices.

Contents:	• Semiconductor Physics
	  ○ Semiconductor materials
	  ○ Bond model
	  ○ Band Theory
	  ○ Charge carrier transport
	
	• Semiconductor diode
	  ○ Abrupt PN junction
	  ○ Metal junctions
	  ○ Zener diode
	
	• Metal-Oxide-Semiconductor Field-Effect-Transistor (MOSFET)
	  ○ Structure
	  ○ Inversion charge Q_i and Threshold voltage V_th
	  ○ Pinch-Off Voltage V_off
	  ○ Characteristics: constant mobility μ_e
	  ○ Characteristics: constant drift velocity v_sat
	  ○ Parasitic capacities
	
	• Bipolar transistor

	○ Structure ○ Operating modes ○ Load transport - flow lines in active forward mode ○ Minority charge carrier concentrations in active forward mode ○ Current components in active forward mode ○ Transistor parameter PNP in active forward mode ○ Band diagram in active forward mode
Textbooks:	Semiconductor Devices by Mauro Zambuto
Assessment	Graded: oral exam 20min. + project report

Mechatronics Master

Control Systems	
Study Program **Study level and semester**	Mechatronics Master, 2nd Semester
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture
Language of instruction	English
Frequency	Winter Semester
Course Coordinator/Instructor	Prof. Dr. Thorsten Zenner E-Mail: thorsten.zenner@reutlingen-university.de
Restrictions	
Prerequisites:	Basic knowledge of communication technologies as presented in lecture "communication systems" **At least one exam in electrical engineering, informatics or communication systems**
Course learning objectives:	Students will have a deeper understanding of state of the art communication technologies like radio communication, IEEE802.x (Ethernet, WLAN, Bluetooth LE), ethernet based fieldbusses and security. They will be able to evaluate different communication technologies according to specific performance indexes like throughput, realtime, security, etc.
Contents:	Physical and technical basics of radio communication. IEE802.x communication (Ethernet, WLAN, Bluetooth) and 6LOWPAN (RFC 6282), Security (Encryption, hash-functions, digital signature, certificates), Functional Safety, ethernetbased fieldbusses (Ethercat, Powerlink, Profinet IRT)
Textbooks:	Lecture notes are provided in German, Andrew Tanenbaum u. a.: Computer Networks, 5. Auflage, Pearson Education Limited, (2014)
Assessment	Graded: oral exam

Control Systems Laboratory	
Study Program **Study level and semester**	Mechatronics Master, 2nd Semester
ECTS Credits	2
Hours per week / total contact hours	2 / 30
Total hours of study	60
Type/Teaching Method	Laboratory
Language of instruction	English
Frequency	Winter Semester
Course Coordinator/Instructor	Prof. Dr. Thorsten Zenner E-Mail: thorsten.zenner@reutlingen-university.de
Restrictions	Only in combination with Control Systems lecture
Prerequisites:	Basic knowledge of communication technologies as presented in lecture “communication systems”
Course learning objectives:	
Contents:	Lab assignments pertaining to the Control Systems lecture. Realtime and Performance testing using the following systems: - EnOcean (without battery), - Texas Instruments (Protokoll SimpliciTI) - Nordic Semiconductor (Bluetooth Low Energy).
Textbooks:	
Assessment	Ungraded: Documentation of laboratory work

Electromagnetic Compatibility	
Study Program **Study level and semester**	Mechatronics Master, 2nd Semester
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr.-Ing. habil. David Pouhè E-Mail: David.Pouhe@Reutlingen-University.DE
Restrictions	Only taught in English if demanded by 5 international students at the minimum
Prerequisites:	Electrodynamics
Course learning objectives:	Students know and understand problems in Electromagnetic Compatibility. They are able to identify EMC problems and elaborate an appropriate solution.
Contents:	In accordance with the given objectives
Textbooks:	
Assessment	Graded: Written Exam

Electromagnetic Compatibility Laboratory	
Study Program **Study level and semester**	Mechatronics Master, 2nd Semester
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Laboratory
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr.-Ing. habil. David Pouhè E-Mail: David.Pouhe@Reutlingen-University.DE
Restrictions	Only taught in English if demanded by 5 international students at the minimum. Only in combination with the EMC lecture.
Prerequisites:	Electrodynamics
Course learning objectives:	
Contents:	Lab assignments pertaining to the Electromagnetic Compatibility lecture
Textbooks:	
Assessment	Ungraded: Documentation of laboratory work

Human-Robot Collaboration Lecture with Optional Laboratory	
Study Program **Study level and semester**	Mechatronics Master, 2nd Semester
ECTS Credits	3 (+3 ECTS for optional laboratory/project work)
Hours per week / total contact hours	2 (4) / 30 (60)
Total hours of study	60 (120)
Type/Teaching Method	Lectures, Practical Training and Projects
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr. rer. nat. Matthias Rätsch E-Mail: matthias.raetsch@reutlingen-university.de
Restrictions	
Prerequisites:	
Course learning objectives:	The students know the fundamentals of the interaction and collaboration of intelligent robots with humans in the times of industry 4.0 and the change from industrial robots to the Personal Assistant, which is hardly distinguishable from humans. Students appreciate that robots are getting faster, stronger and more intelligent and therefore why they are better at playing chess, Go and StarCraft II. Students will acquire knowledge and will be able to answer questions about AI and robotics, in areas such as: How and when is the Turing Test "applied"? Secrets of non-verbal interaction? Avatars in computer games and virtual worlds? How do Google Glass + Siri work and what can they be used for? Will robots be the better people? Will they replace people in my future career? What is singularity and transhumanism? The students are familiar with current developments in the field of collaborative, intelligent robots, have initial experience in the practical use of these systems and can assess the effects on the areas of life of those involved. An optional follow-up project can be selected to consolidate the learning objectives.
Contents:	- Basics of modern 3D sensor technology in mobile robotics. - Artificial intelligence for autonomous and collaborative robots. - Autonomous localization and navigation using monocular SLAM techniques. - Verbal and non-verbal interaction between robots and humans. - The use, impact and vision of the new generation of intelligence and robots.

	- Practical approach to interactive, mobile and collaborative robots, as well as SDKs. - Design and development of concepts, modules and prototypes for leading collaborative robots in industrial projects or for RC@Home. - if applicable, continuation of the successes of the world champion team.
Textbooks:	Lit. on Pattern Recognition and Machine Learning: e.g. by Christopher M. Bishop (ISBN-10: 0387310738, ISBN-13: 978-0387310732) Lit. on Swarm Intelligence/Image and Video Processing: e.g. publications by M. Rätsch et al., s. publications by Prof. Matthias Rätsch https://www.visir.org/people/ Lit. on Computer Vision and Robotics: e.g. "Robotics, Vision and Control" by Peter Corke (ISBN-10: 3642201431, ISBN-13: 978-3642201431) Lit. with philosophical background and visions about virtual and mixed reality future worlds: e.g. "Der futurologische Kongreß" by Stanislaw Lem, "Brave New World" by Aldous Huxley, "The Matrix" Triology by Andy and Larry Wachowski, "i,ROBOT" by Alex Proyas, "Bicentennial Man" by Chris Columbus, "Gottes Gehirn" by Jens Johler and Olaf-Axel Burow Lit. on SCITOS with MIRA support and sources, e.g.: - MIRA Homepage: http://www.mira-project.org/joomla-mira/ et al. in RELAX - Comparison MIRA vs. ROS: http://www.mira-project.org/MIRA-doc/ComparisonWithROSPage.html - MIRA VBox and projects from students (s. RELAX and http://projekte.rt-lions.de/SCITOS)
Assessment	Graded: Project work, seminar paper, presentation

Machine Vision and Artificial Intelligence Lecture with Laboratory	
Study Program **Study level and semester**	Mechatronics Master, 2nd Semester
ECTS Credits	6
Hours per week / total contact hours	5 / 75
Total hours of study	180
Type/Teaching Method	Lectures and Presentations
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr. rer. nat. Matthias Rätsch E-Mail: matthias.raetsch@reutlingen-university.de
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course
Prerequisites:	
Course learning objectives:	The students are familiar with the basics of machine learning (artificial intelligence) and the use of image processing in industrial environments and especially in the robotics and automotive industries. They will be able to create algorithms for simple application examples, which will then be implemented and tested in practical courses and projects. The students are capable of putting together an intelligent image processing system from available components which they can then use to complete simple tasks. The students are proficient in 3D sensors as well as 3D image and video processing, which they will then apply hands-on in projects with interactive mobile robots and assistance and service systems. The students will discuss and be familiar with the social challenges and opportunities of AI as well as questions of social ethics and acceptance research
Contents:	- Basics: Components of a Learning Machine Vision System - Data recording: camera technology, pre-processing, colour display, optics, lighting technology - Data processing (feature extraction, image analysis, feature extraction, classification/segmentation, error analysis) - Feature extraction: convolution, low pass, high pass, morphological filter feature space transformation: Chain rule, contour slider, applications - error analysis: FAR/FRR, lin. separable, error class analysis, efficiency - AI basics: Boolean and Fuzzy logic, classification, definition KI, Turing test, world knowledge theory ML: learning styles, DTree, Random Forests, NN, Perceptron, SVM (Lin/Non-lin, Kernel Trick)

	- 3D Image Processing (3D Sensors; RGB-D, TOF, Stereo; Shape from Shading/Motion, SLAM)- Video Processing (4D): Detection (Sliding Window, Image Pyramids, Sampling Theorem, Frequency Analysis, Compression, Blending), Tracking (Condensation, Motion Detection) - Model based machine learning: face modelling (representation of 3D data, data procurement for 3D data, morphable face model) PCA (data/corr/loading matrix, SVD, dim reduction, eigenvalue problem, eigenfaces) - Deep Learning - CNNs: Meaning, Difference NN to CNN, Layer Types, Convolution, Pooling, ReLu, Applications- History and visions of AI: Exp. Growth, Singularity, Transhumanity, Society. Challenges/opportunities for action, social ethics, acceptance
Textbooks:	Script based on the lecture slides. Corke, P.: Robotics, Vision and Control. Springer, Berlin. Jähne, B.: Digitale Bildverarbeitung. Springer, Berlin. Demant, C.; Streicher-Abel, B.; Springhoff, A.: Industrielle Bildverarbeitung: Wie optische Qualitätskontrolle wirklich funktioniert. Springer, Berlin. Bishop, C.M.: Pattern Recognition and Machine Learning
Assessment	Graded: Project work, seminar paper, presentation

Renewable Energies	
Study Program **Study level and semester**	Mechatronics Master, 2nd Semester
ECTS Credits	3
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture with integrated exercises
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr.-Ing. Antonio Notholt E-Mail: antonio.notholt@Reutlingen-University.DE
Restrictions	
Prerequisites:	
Course learning objectives:	The students are familiar with technologies and processes of the production of electrical energy from renewable sources. They are able to perform a simple layout of installations. They know the key indicators and know how to apply them for assessing and comparing different installations. They are familiar with systemic components, common communication and information technologies as well as the potential of selected future innovations.
Contents:	Energy and climate protection Solar radiation Photovoltaics wind power Hydroelectric power Geothermal energy Use of biomass Hydrogen generation, fuel cells and methanation Economic efficiency calculations Simulation Communication and Information Technologies Integration of renewable energies in electrical grids
Textbooks:	Volker Quaschning, Regenerative Energiesysteme: Technologie - Berechnung - Simulation. ISBN 978-3-446-44267-2
Assessment	Graded: Presentation, seminar paper

Distributed Energy Systems and Energy Efficiency, Master

Distributed Economy in the Energy Sector	
Study Program **Study level and semester**	Distributed Energy Systems and Energy Efficiency Master, 2nd semester
ECTS Credits	3 ECTS Credits
Hours per week / total contact hours	2 / 30
Total hours of study	90
Type/Teaching Method	Lecture, use of specific software and project
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr.-Ing. Debora Coll-Mayor E-Mail: Debora.coll-mayor@reutlingen-university.de
Restrictions	None
Prerequisites:	Knowledge of Energy markets and energy economy
Course learning objectives:	– The students know the basics of Bockchain based Technologien; – The students learn about the regulatory framework of these new technologies – The students can develop simple use cases using blockchain based solutions – The students can develop new business cases based on those solutions – The students learn about basics and new tendencies in transactive control
Contents:	– Distributed ledger technologies; – Use of cryptocurrencies in the energy economy; – Smart contracts and distributed registers; – Analysis of new System Use Cases; – Analysis of new Business Use Cases; – Standardisation and regulatory barriers; – A step forward: The concept of transactive control.
Textbooks:	The literature will be given during the lecture.
Assessment	Graded: 1 hour written exam and a project with oral presentation

Projects for Bachelor and Master Students

<table>
<tr><td colspan="5">Semester Engineering Project</td></tr>
<tr><td>Study Program

Study level and semester</td><td colspan="4">Mechatronics, Mechanical Engineering, Distributed Energy Systems and Energy Efficiency, Microelectronics and Power Electronics

Bachelor and Master</td></tr>
<tr><td>Type of project</td><td>Project I</td><td>Project II</td><td>Project III</td><td>Project IV</td></tr>
<tr><td>ECTS Credits</td><td>6</td><td>10</td><td>15</td><td>30</td></tr>
<tr><td>Hours per week</td><td>10</td><td>15</td><td>20</td><td>40</td></tr>
<tr><td>Total hours of study</td><td>180</td><td>300</td><td>450</td><td>900</td></tr>
<tr><td>Type/Teaching Method</td><td colspan="4">Project</td></tr>
<tr><td>Language of instruction</td><td colspan="4">English</td></tr>
<tr><td>Frequency</td><td colspan="4">Every Semester</td></tr>
<tr><td>Course Coordinator/Instructor</td><td colspan="4">Prof. Dr.-Ing. Ertugrul Sönmez
E-Mail: ertugrul.soenmez@reutlingen-university.de</td></tr>
<tr><td>Restrictions and procedure</td><td colspan="4">Offered on demand for a limited number of students and only if a professor agrees to act as project supervisor.

Students interested in participating in a project need to
1. Search the research profiles of professors in the School of Engineering (download PDF file).
Projects positions are regularly offered by:
<table>
<tr><th>Field</th><th>Professor</th><th>Website</th></tr>
<tr><td rowspan="7">Mechatronics</td><td>Prof. Rätsch</td><td>https://www.visir.org/category/research/</td></tr>
<tr><td>Prof. Schullerus</td><td>https://www.electronics-and-drives.de/forschung/antriebstechnik/?L=0</td></tr>
<tr><td>Prof. Soenmez</td><td>https://www.electronics-and-drives.de/forschung/leistungs-und-mikroelektronik/?L=0</td></tr>
<tr><td>Prof. Scheible</td><td>https://www.electronics-and-drives.de/forschung/entwurfsautomatisierung/</td></tr>
<tr><td>Prof. Notholt</td><td></td></tr>
<tr><td>Prof. Pouhè</td><td></td></tr>
<tr><td>Prof. Zenner</td><td></td></tr>
<tr><td>Energy Systems and Efficiency</td><td>Prof. Truckenmüller, Reutlingen Energy Center</td><td>https://www.tec.reutlingen-university.de/forschung-industrie/forschung/rez-reutlinger-energiezentrum/forschung-am-rez/</td></tr>
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	<table><tr><td rowspan="3">Mechanical Engineering</td><td>Prof. Thomas</td><td>https://www.tec.reutlingen-university.de/prof-thomas/forschungsprojekte/</td></tr><tr><td>Prof. Ritter</td><td>https://www.tec.reutlingen-university.de/fakultaet/unsere-projekte/pep-produkt-entwicklungsprojekt/</td></tr><tr><td>Prof. Nebeling</td><td></td></tr></table> 2. Send an updated CV including three preferred research areas/supervisors as well as information on theoretical and practical knowledge in the relevant areas to student mobility coordinator Max Alber (max.alber@reutliingen-university.de) who will check the availability of projects. 3. Students will be notified after a supervising professor has been confirmed. Exact project topics will be defined afterwards.
Prerequisites:	**Commitment to work on the project in accordance with the above stated hours per week during the whole semester is mandatory**
Course learning objectives:	Students will work independently on a given engineering topic. Students will develop and apply a suitable approach to solve the problem
Contents:	Depending on project topic.
Textbooks:	
Assessment	Graded: Documentation of research work according to scientific standards, final report or presentation including poster summarizing research results