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/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 2 international Students at the maximum can be admitted to this course
Prerequisites:	None
Course learning objectives:	At the end of this course students solve complex problems individually as well as in a team setup. They analyze communication failures and create communication strategies in a leadership context. Conflicts and negotiation situations are understood and actively managed. The fundamentals of human motivation, personal preferences and team behavior are understood and practically used to lead a project to success.
Contents:	Understanding and applying the following methods and principles: Creativity techniques (e.g. Brainstorming, Mind Maps, De Bono's Six Thinking Hats), problem solving techniques (e.g. Root Cause Analysis, 8D reporting, Failure Mode and Effects Analysis), problem structuring and prioritization with logic trees (Deductive Tree, Hypothesis Tree, Yes/No-Tree), communication and communication failures (4 sides of a message, Johari Window), communication in leadership situations, conflicts and conflict management, HarvardPrincipled Negotiation Model, personality & preferences – MBTI model – influencing others, motivation, team management, virtual teams, outlook on intercultural management, outlook on change management.

Textbooks:	Meredith, Jack; Mantel, Samuel: 'Project Management – A Managerial Approach', 7th ed. (International Student Version), Wiley, 2010. 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; 10th Ed. (2009).
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/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 2 international Students at the maximum can be admitted to this course
Prerequisites:	None
Course learning objectives:	Understanding: Projects, triple constraint, differences between working in projects and working in operations, project success and failure, tasks of a project manager, project organization 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.
Contents:	Introduction to core project management principles and methodologies, with the focus on structured project planning and optimization. Practical applying the following methods and concepts on projects and case studies: 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, Organizational 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:	Basics: Meredith, Jack; Mantel, Samuel: 'Project Management – A Managerial Approach', 7th ed.(International Student Version), Wiley, 2010. Jenny, Bruno: 'Projektmanagement', vdf Hochschulverlag, Zürich 2005.

	Additional: Kerzner, Harold: 'Project Management: A Systems Approach to Planning, Scheduling, and Controlling ', John Wiley & Sons; 10th Ed. (2009).
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
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Mr. Michael Ribeiro; Mr. Tobias Loida E-Mail: michael.ribeiro@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 be able: ▪ to structure and plan projects ▪ to estimation the effort to reach project targets ▪ to deduce a cost baseline ▪ to use and adapt techniques for cost and risk analysis ▪ to forecast future trends ▪ to report (interim) results, according the needs of information addresses ▪ to define recovery measures
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.
Textbooks:	Various arcticles
Assessment	Graded: Written exam (2hrs)

Heat Transfer Technology	
Study Program **Study level and semester**	International Project Engineering Bachelor, 4th Semester
ECTS Credits	4
Hours per week / **total contact hours**	3 / 45
Total hours of study	120
Type/Teaching Method	Lecture
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Dr.-Ing. Argun Yetkin E-Mail: argun.yetkin@reutlingen-university.de
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course
Prerequisites:	
Course learning objectives:	Learners know the fundamentals of heat transfer. Learners are able to apply gained knowledge to analyze, design and select heat transfer objects, like heat exchangers, radiators and building heating components, including temperature measurement components, their usage and limitations.
Contents:	Heat Transfer convection and conduction, heat transfer coefficient non-dimensional parameters conservation equations and boundary conditions internal and external flow with heat transfer free and forced convection with heat transfer transfer of thermal energy by radiation extended surfaces overall heat transfer coefficient heat exchanger analysis with the log-mean temperature difference method heat loss analysis of buildings Technical Temperature Measurement temperature measurement basics active & passive temperature sensors signal conditioning & data acquistion potential problems infrared thermometry basics
Textbooks:	Pitts, Sissom, Heat Transfer, 2. Edition (2012), Schaum's Outline – Mc Graw Hill. Incropera/de Witt/Bergmann/Lavine, Introduction to Heat Transfer, Wiley, 5 edition (2006)
Assessment	Graded: Written exam

Heat Transfer Technology Laboratory	
Study Program **Study level and semester**	International Project Engineering Bachelor, 4th Semester
ECTS Credits	2
Hours per week / **total contact hours**	2 / 30
Total hours of study	60
Type/Teaching Method	Laboratory. Introduction to the lab, mentoring in modelling and simulation, supervision
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Dr.-Ing. Argun Yetkin E-Mail: argun.yetkin@reutlingen-university.de
Restrictions	Only in combination with Heat Transfer lecture. Only 5-6 international Students at the maximum can be admitted to this course.
Prerequisites:	
Course learning objectives:	The purpose of this course is to practice a product development process typical for a technology company. Students will work in competing teams to find individual solutions for given tasks from the area of heat transfer. Methodologies used in this lecture are benchmark testing, function analysis, build-up of a simulation model as a virtual prototype and a final presentation to share the results.
Contents:	Lab assignments pertaining to the Heat Transfer Technology lecture. Testing in the thermo- and fluid dynamics lab, modelling and simulation with MatLab / Simulink in the computer lab.
Textbooks:	
Assessment	Ungraded: Lab report, simulation model, final presentation, testat

Information Management	
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, case studies, group tasks
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:	At the end of the course students are able to 1. understand the challenge of information needs of managers in a global world 2. describe the theoretical basics of information management 3. analyze the specific situation of a company by using the appropriate techniques and methods 4. discuss the pros and cons of current state of the art technology associated with Information Management (IM) / Information Technology (IT), especially software solutions to define recovery measures
Contents:	Globalization is one of the most important challenges for corporations. As a consequence, global acting companies face a high level of dynamic and complexity in their business model. The usual approach to handle this is: a. Definition and implementation of processes b. Definition and implementation of methods and standards c. Mapping of a. and b. in an IT- / Software landscape • The course deals with the challenge, to handle the complexity of business models and ensure competitive advantages, with the help of information management. • Therefore students should understand the importance of information as basis for entrepreneurial decisions and gain the capability to prepare a objectified information content by using the appropriate (IT) system and method.
Textbooks:	a. Rainer / Cegielski, 2012: Introduction to Information Systems - enabling and transforming business. b. various arcticles
Assessment	Graded: Written exam (1h)

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 (65%) plus integrated assignment (35%)
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:	Students understand the content and the principles of modern Quality Management Systems, such as the DIN EN ISO 9000 industrial standard. They understand the PDCA (Plan-Do-Check-Act) performance management cycle. They understand the principles of the quality-based organization and of customer-centric thinking. The students understand important basic quality management methods and tools (e.g. 8D reporting, quality control cards, Root-Cause Analysis). They are able to apply these tools to practical problems. The students know the principles of advanced quality management methods, such as the FMEA, Six Sigma, Quality Function Deployment. The students understand the tasks and responsibilities of quality management in different function in an enterprise
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.)

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:	Based on a theoretical foundation the students will be able to choose and apply appropriate strategic models. The participants will receive an overview of the different management theories, followed by a business and corporate level strategy part and finally will be introduced to various motivational and leadership models and theories.
Contents:	Based on a case study the students will apply learned models and formulate strategies for their "own" business. Short presentations will be given by the students during lectures to present the outcome of their team work. This will provide the students with an overview over the whole strategic process.
Textbooks:	Cascio, W. F., Boudreau, J. W. (2013) Short Introduction to Strategic Human Resource Management, University Press Dessler, G. (2013) Human Resource Management, Pearson, 11th edition Torrington, D., Hall, L., Taylor, S. (2005), Human Resource Management, Prentice Hall, 6th edition
Assessment	Graded: Written exam (2 hrs.) plus project assignment

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:	Students will gain a comprehensive overview over the whole range of tasks of the Human Resource Department. Attention will be paid to the strategic importance and the changes that have taken place in the last years within Human Resource Management. Special focus will be put on issues that the student will most likely encounter in his/her career like recruitment, appraisal interviews, right sizing. Students will take an active part in the lectures through group work.
Contents:	1. HRM: Past and Future 2. War of talents, employer branding 3. Selection process 4. Performance appraisal 5. Compensation policies 6. Retention and resignation
Textbooks:	Cascio, W. F., Boudreau, J. W. (2013) Short Introduction to Strategic Human Resource Management, University Press Dessler, G. (2013) Human Resource Management, Pearson, 11th edition Torrington, D., Hall, L., Taylor, S. (2005), Human Resource Management, Prentice Hall, 6th 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:	The students understand the elements of culture. They analyze existing organizational cultures using different cultural models. They specify target cultures. They select and design interventions to change an existing organizational culture into the selected target culture. They plan change projects and define suitable controlling approaches for successful execution.
Contents:	Understanding culture Models of organizational cultures Change analysis: - Change Context Analysis: Scope, Time, Investment, Targets, Resistance,... - 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,...) 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, 2009,ISBN 978-0-273-70802-5
Assessment	Graded: Case study and 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	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:	The students have the knowledge to successfully pass the “GPM Basiszertifikat” (i.e. an internationally recognized professional IPMA Project Management Certificate).
Contents:	ICB 3.0 Competence Elements: 1.01 project management success – 1.02 interested parties – 1.03 projectrequirements & objectives – 1.04 Risk & opportunity – 1.05 quality – 1.06 projectorganisation – 1.07 teamwork – 1.08 problem resolution – 1.09 project structures –1.10 scope & deliverables – 1.11 time & project phases – 1.12 resources – 1.13 cost& finance – 1.14 procurement & contract – 1.15 changes – 1.16 control & reports –1.17 information & documentation – 1.18 communication – 1.19 start-up –1.20 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	Mr. Daniel Fierro E-Mail: Daniel.fierro@Reutlingen-University.DE
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course.
Prerequisites:	
Course learning objectives:	The students plan, optimize and control projects using professional project management software (e.g.MS Project 2010).
Contents:	Principles and limitations of professional project planning software – basic settings –working with Gantt-charts – working with networked Gantt-charts – milestone plans– project network diagrams – activities and the triple constraint – other constraints –assigning resources – calculating project costs – manual project optimization – automatedproject optimization – project controlling – advanced project controlling - special features.
Textbooks:	Renke Holert: Microsoft Office Project 2010 – Das Profibuch, Unterschleißheim 2011, ISBN ISBN-13: 978-3-86645-448-4, Downloaded: http://www.microsoft-press.de/support.asp
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	Prof. Dr.-Ing. Tessa Taefi E-Mail: Tessa.Taefi@Reutlingen-University.DE
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course.
Prerequisites:	
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	2
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. Dr.-Ing. Tessa Taefi E-Mail: Tessa.Taefi@Reutlingen-University.DE
Restrictions	Only 5-6 international Students at the maximum can be admitted to this course.
Prerequisites:	
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

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:	At the end of the course students should: • have understood the difference between invention, innovation, product and innovation management • be able to use the appropriate measure or method in specific circumstances and can explain the innovations of a company • be trained in analytical, methodical and economical competences, related to product and innovation management in general • be qualified to define needed product information in specific situations and should be able to evaluate the type(s) of innovations of a company and deduce a clear statement
Contents:	The course deals with the challenge of a company to position their products continuously successfully on the markets. • Therefore the course deals with 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:	a. Malik / Robers / Horx / Micic / Minx / EBS / b. Product and Innovation strategy Daimler Chrysler Sparte VAN 2000 - 2002 c. 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:	At the end of the course the students will have a thorough understanding of the most important cultural challenges. The focus will be on national cultures but also culture differences within e.g. generation and gender will be discussed. The students will obtain a clear understanding of their own culture thus being able to anticipate pitfalls within the host culture. The course will prepare the student to handle potential conflicts in the working environment and provide them with a set of tools of how to handle these issues.
Contents:	The course is a mixture of lectures, presentations by the students, group work and case studies. It is very practical and will also draw on students' own experiences.
Textbooks:	Browaeys, M.-J., Price, R. (2011) *Understanding Cross-Cultural Management,* FT Press, 2nd edition. Hall, E.T., Hall M. R. (1990) *Understanding Cultural Differences*, Yarmouth: Intercultural Press. Hofstede, G., Hofstede, G. J. (2004) *Cultures and Organizations – Software of the Mind*, Mcgraw-Hill Professional, 2nd edition. Rothlauf, J. (2009), *Interkulturelles Mangement,* Oldenbourg Verlag München, 3. Auflage. Trompenaars, F., Hampden-Turner, C. (2012) *Riding the Waves of Culture: Understanding Cultural Diversity in Business*, Nicholas Brealey Publishing, 3rd edition.
Assessment	Graded: Written seminar paper (70%), group presentations (30%)

Mechanical Engineering Bachelor

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 analysis, use the most often available tools and try to interpret the results. There are lectures where short presentations introduce the problems and labs where the students work on these problems. A final presentation of a small project follows at the end.
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, computer assignments, measurements
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

Numerics	
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. 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 numerics (solving equations, integration, …). ▪ Estimating the quality of numerical solutions. ▪ Improving programming skills.
Contents:	Numerics deals with the finding of specific numerical data for different problems. Starting with a repetition of basic mathematical terms we deal with some algorithms to solve linear equation systems, do Fourier series studies and discuss about data compression. Numerical integration and handling of ordinary differential equation follows. Root finding and some fast iterative methods complete the lecture.
Textbooks:	
Assessment	Graded: There is one assignment and a 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 Altair Hyperworks.
Textbooks:	Technische Dynamik, Schiehlen, W. und Eberhard, P. ; Finite element procedures, Bathe, K.-J.
Assessment	Graded: There is one assignment, some presentations and a final written exam (120 min).

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

Research and Development Project	
Study Program **Study level and semester**	Mechanical Engineering Master, 2nd semester
ECTS Credits	5
Hours per week / total contact hours	10 / 60
Total hours of study	150
Type/Teaching Method	Project
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr.-Ing. Steffen Ritter E-Mail: Steffen.Ritter@Reutlingen-University.DE
Restrictions	Offered on demand for a limited number of students
Prerequisites:	**Commitment to work one complete day (10 hours) per week during the whole semester on the project 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:	Project topics will be defined at the start of each semester
Textbooks:	
Assessment	Graded: Documentation of research work according to scientific standards, final presentation including poster summarizing research results

Mechatronics Bachelor

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	Every Semester
Course Coordinator/Instructor	Prof. Dr. rer. nat. Prof. Dr. Thorsten Zenner E-Mail: thorsten.zenner@reutlingen-university.de
Restrictions	None
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	Every 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:	Previous knowledge in this field required.
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

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	Every Semester
Course Coordinator/Instructor	Prof. Dr. Thorsten Zenner E-Mail: thorsten.zenner@reutlingen-university.de
Restrictions	
Prerequisites:	
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	Every 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

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. Ulrich Schlienz E-Mail: ulrich.schlienz@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

Mechatronics Master

Distributed Control in Power Grids	
Study Program **Study level and semester**	Mechatronics 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 Prof. Dr.- Ing. Antonio Notholt E-Mail: Debora.coll-mayor@reutlingen-university.de
Restrictions	None
Prerequisites:	Knowledge of control theory and programing skills
Course learning objectives:	– The students will learn about control strategies in distributed energy systems – The students will be able to implement a distributed control, i.e. agent based, in the different energy resources of a microgrid – The students will furthermore use distributed ledger technologies applied to the agent to facilitate M2M communication – The students will learn about how to approach different current use cases in this area
Contents:	– Analysis of management and control strategies for microgrids – Basic functionalities of agent-based control for energy systems – Basics on distributed ledger technologies and their application to control processes for M2M communication – Development of system architectures based on the distributed control strategies – Basic deployment process of an architecture in a laboratory environment (proof of concept)
Textbooks:	The literature will be given during the lecture.
Assessment	Graded: 20% Final examination (1h), 80% Project with oral presentation

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	Every Semester
Course Coordinator/Instructor	Prof. Dr. Thorsten Zenner E-Mail: thorsten.zenner@reutlingen-university.de
Restrictions	None
Prerequisites:	Basic knowledge of communication technologies as presented in lecture “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: Written 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	Every 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

Smart Sensor and Control Systems Laboratory	
Study Program **Study level and semester**	Mechatronics Master, 1st Semester
ECTS Credits	3
Hours per week / total contact hours	3 / 45
Total hours of study	90
Type/Teaching Method	Laboratory
Language of instruction	English
Frequency	Every Semester
Course Coordinator/Instructor	Prof. Dr. rer. nat. Stefan Mack E-Mail: stefan.mack@reutlingen-university.de
Restrictions	
Prerequisites:	Basic knowledge in C-programming and Matlab/Simulink as well as in all mechatronics subjects (bachelor level). The lab contents are on Master level
Course learning objectives:	The students will study the design of smart sensors and of multi sensor systems. They will learn how embedded systems will make sensors "intelligent". They will get to know the different data and energy interfaces smart sensors can have. They achieve skills in microcontroller, Matlab, LabView and/or C-programming. The students will finally learn how to integrate the smart sensor (or the multi sensor system) into a real mechatronic system like a small robot car. The student will learn the application of feedback control algorithms
Contents:	The international student will join a 2-person group of domestic students. The main task of the group will be the integration of sensors like TOF-Laser-Scanner, accelerometers, gyros into a small mechatronic system like a robot car. This car shall meet a predefined task, e.g. finding a coloured object on the floor. Most of the project work will be the programming of Arduino based microcontrollers and embedded computers like Beagle Bone or Raspberry Pi.
Textbooks:	There is no specific literature available. Data sheets, application notes and information from the internet are used.
Assessment	Ungraded: Documentation of laboratory work

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

Transnational Market Issues and International Business Models	
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 Smart Grids Technologies and energy economy
Course learning objectives:	– The students will learn about international use cases in the field of smart energy systems with focus on regulation and standardization activities. – The students will be able to determine the development of decentral energie systems in the main markets – The students will know instruments and methods for the identification and assessment of international activities in the field of smart energy systems; – The students will learn about international case studies for business models, strategies and products.
Contents:	– Analysis of generic (functional and system) international requirements for smart energy applications; – Understanding the “Top-down” approach to the identification of standardization issues: from requirements to standardization, starting at the system or system-architecture level; – Learning how to use “use case” methodology, to facilitate cooperation at a system level between different stakeholders; – Establishing a working architecture model in smart energy business planning: Mapping from business use cases to system use cases (e.g. SGAM); – Investigation of international roadmaps for smart energy systems; – Analysis of new trends in business models in the field of smart energy systems; – Display of international players in the smart energy field: DoE, IEEE, IEA, EC, ISGAN, and their roles and relationships.
Textbooks:	The literature will be given during the lecture.
Assessment	Graded: 1 hour written exam and a project with oral presentation

Power Electronics and Microelectronics

Microwave Circuit Design	
Study Program Study level and semester	Power Electronics and Microelectronics Master, 3rd semester
ECTS Credits	9
Hours per week / total contact hours	6/ 90
Total hours of study	180
Type/Teaching Method	Lecture
Language of instruction	English
Frequency	Winter Semester
Course Coordinator/Instructor	Prof. Dr.-Ing. Ingmar Kallfass E-Mail: ingmar.kallfass@ilh.uni-stuttgart.de
Restrictions	None
Prerequisites:	Prior knowledge in the areas of high frequency techniques, semiconductor technology and analog circuit design is recommended.
Course learning objectives:	Students master the theory and design of monolithic integrated microwave and millimeterwave circuits (MMIC). They can solve typical challenges by adopting suitable circuit design methods. They are enabled to design low noise amplifiers, broadband ampifiers and power amplifiers on the basis of microwave network analysis, the theory of planar integrated waveguides, circuit-design oriented modeling of integrated devices, typical circuit design methods, linear and non-linear circuit analysis and layout techniques. The students are able to understand pertinent, course-related scientific literature. Technical terms from the area of microwave circuit design are known in German and in English language.
Contents:	1. The Millimeterwave Spectrum: MMIC Applications and Technologies 2. Microwave Network Analysis 3. Planar Transmission Line Theory 4. Building Elements of MMICs 5. Linear Circuits I: Low-Noise Amplifiers 6. Linear Circuits II: Broadband Amplifiers 7. Nonlinear Circuits I: Microwave Power Amplifiers
Textbooks:	D. Pozar, Microwave Engineering. Wiley, 2004 G. Vendelin, A. Pavio, and U. Rohde, Microwave Circuit Design Using Linear and Nonlinear Techniques. Wiley, 2005 F. Ellinger, “Radio Frequency Integrated Circuits and Technologies”, Springer, 2008 O. Zinke, H. Brunswig, Hochfrequenztechnik I und II M. Hoffmann, Hochfrequenztechnik: Ein Systemtheoretischer Zugang
Assessment	Graded: Exam

Projects for Bachelor and Master Students

Semester Engineering Project			
Study Program **Study level and semester**	Mechatronics, Mechanical Engineering, Distributed Energy Systems and Energy Efficiency, Microelectronics and Power Electronics Bachelor and Master		
Type of project	Project I	Project II	Project III
ECTS Credits	6	15	30
Hours per week	10	20	40
Total hours of study	180	450	900
Type/Teaching Method	Project		
Language of instruction	English		
Frequency	Every Semester		
Course Coordinator/Instructor	Prof. Dr.-Ing. Ertugrul Sönmez E-Mail: ertugrul.soenmez@reutlingen-university.de		
Restrictions and procedure	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. Peruse the research profiles of professors in the School of Engineering (download PDF file). The following professors offer projects positions on a regular basis: - Mechatronics: Professors Rätsch; Schullerus; Notholt; Zenner; Pouhè - Energy Systems and Efficiency: Prof. Truckenmüller - Mechanical Engineering: Professors Thomas; Ritter - Power Electronics and Microelectronics: Prof. Scheible 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