



**HOCHSCHULE LANDSHUT**  
HOCHSCHULE FÜR ANGEWANDTE WISSENSCHAFTEN

## **Module Catalogue**

for the

**Bachelor's program**

**Sustainable Industrial Operations and Business**

(Full-time study)

**at the**

**Faculty of Electrical Engineering and Industrial Engineering**

at the

Hochschule Landshut

for

**Winter Semester 2026/27 and Summer Semester 2027**

Resolved in the Faculty Council on July, 21st 2026

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## 1. General notes

### 1.1 The most important documents for your studies

The three most important relevant documents for your studies are:

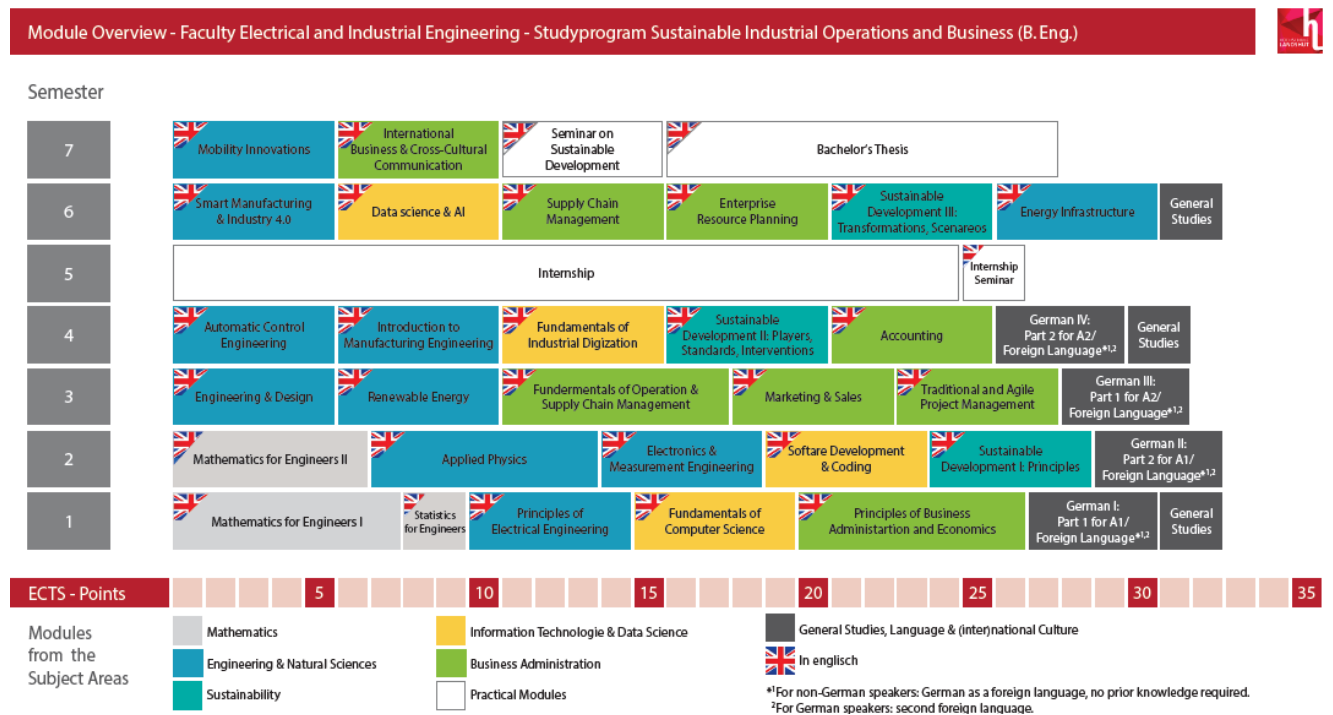
- **Study and Examination Regulations (SPO)** - here it is bindingly specified which compulsory and elective modules you must complete as part of your studies, as well as their semester hours per week and ECTS credits.
- Semester-actual **study and examination schedule** - here you can find out which courses are offered in the current semester. You can also find out the type of certificates and examinations for the respective module.
- This **Module Catalogue** supplements the study and examination regulations and the study and examination plan. The module objectives and contents of all modules offered in the degree programs are described here. You will also find the recommended literature here. The module Catalogue may also list modules that are not currently offered.

Please note on the formation of the overall examination result (often also referred to as "Bachelor degree"):

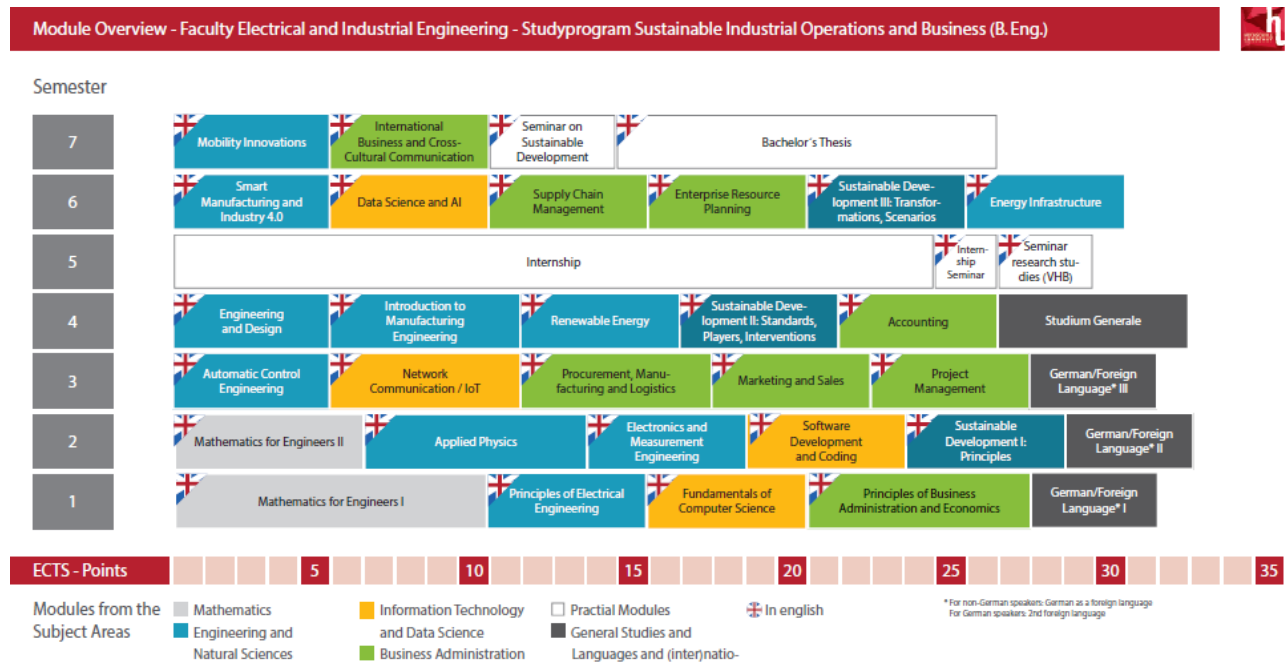
The module grades are included in the overall examination result with weights that are specified in the annex to the Study and Examination Regulations (Studien- und Prüfungsordnung; SPO). The "Proportion of the overall audit result" for the respective modules is always shown for the latest Study and Examination Regulations (Studien- und Prüfungsordnung; SPO) except for those modules, that only apply to former Study and Examination Regulations (Studien- und Prüfungsordnung; SPO).

Different SPO versions may apply to different academic years of a degree program.

The following diagram shows the course of studies according to the SPO for all students starting October 2025 or later with a total of 486 audit points applying to the proportion of the overall audit result. All modules are either compulsory or elective modules.



The following diagram shows the course of studies according to the former SPO for all students, that started before October 2025 with a total of 499 audit points applying to the proportion of the overall audit result. All modules are either compulsory or elective modules.



The program is a full-time program. However, due to the study & work program, there should be no lectures on Monday and Friday, with some exceptions, i.e. for language courses etc. This should give students sufficient time to pick up a part-time job in parallel to the studies.

The standard period of study is seven semesters. Successful completion of the program is rewarded with a total of 210 ECTS credits, i.e., credit points according to the European Credit Transfer and Accumulation System (ECTS). The program comprises six theoretical semesters and one practical semester, which serves as the fifth semester. The program concludes with a bachelor's thesis.

A general studies program is integrated into the degree program. The Studium Generale (general studies) comprises 6 ECTS points. The modules of the Studium Generale are offered in a separate catalogue throughout the university and can be taken in any semester. Details on the module catalogue "Studium Generale" can be found at [Fakultät GKM – Studium – Studium Generale - Modulhandbuch](#).

## 2. Module descriptions for the 1st to 4th semester

### 2.1 Compulsory modules in the 1st and 2nd semester

#### SIOB100 - Mathematics for Engineers I

|                                                   |                                        |  |  |  |  |
|---------------------------------------------------|----------------------------------------|--|--|--|--|
| <b>Module number</b>                              | SIOB100                                |  |  |  |  |
| <b>Module designation according to SPO or SPP</b> | Mathematics for Engineers I            |  |  |  |  |
| <b>Language</b>                                   | English                                |  |  |  |  |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |  |  |  |  |
| <b>Person responsible for the module</b>          | Prof. Dr. Michael Bethke               |  |  |  |  |

|                      |                     |  |  |  |  |
|----------------------|---------------------|--|--|--|--|
| <b>Study section</b> | First study section |  |  |  |  |
| <b>Module type</b>   | Mandatory module    |  |  |  |  |
| <b>Module group</b>  | -                   |  |  |  |  |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 7            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 210          | 90                          |                 | 120               |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 6            | 4                           | 2               | -                 | -                   |

|                                                       |                                                                                                                                                                 |  |  |  |  |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                                               |  |  |  |  |
| <b>Recommended prerequisites</b>                      | Working through the exercises                                                                                                                                   |  |  |  |  |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |  |  |  |  |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                                |  |  |  |  |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                        |  |  |  |  |
| <b>Proportion of the overall audit result</b>         | 7/486 (see the note on this in section 1.1)                                                                                                                     |  |  |  |  |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |  |  |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <u>Knowledge:</u><br>Thorough knowledge of the relevant subjects for industrial engineering<br>Mathematical terms, laws, analytical and numerical calculation methods<br><u>Skills and competences:</u> <ul style="list-style-type: none"> <li>- Ability to confidently apply this knowledge to tasks in different professional fields for industrial engineers</li> <li>- Training in practice-oriented mathematical ways of thinking and development of abstraction skills</li> </ul>                                                                                                                                                                                                            |  |  |  |  |
| <b>Contents</b>                                       | <ul style="list-style-type: none"> <li>- General basics (equations, inequalities, systems of equations, vector calculus)</li> <li>- Functions and curves (general properties, coordinate transformations, rational functions, algebraic functions, trigonometric functions, arc functions, exponential functions, logarithmic functions, hyperbolic functions)</li> <li>- Complex numbers (definition and representation of a complex number, complex calculus, applications of complex calculus)</li> <li>- Differential calculus with one variable (derivative of a function, differentiation rules, applications of differential calculus)</li> <li>- Taylor series</li> </ul>                  |  |  |  |  |
| <b>Media</b>                                          | Blackboard, overhead projector, tablet PC, calculator                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |  |  |  |
| <b>Literature</b>                                     | The respective current edition of: <ul style="list-style-type: none"> <li>- Croft, Anthony and Davison Robert: Mathematics for engineers. Pearson, 5th edition, 2019</li> <li>- Jeffrey, Alan: Mathematics for Engineers and Scientists. Chapman and Hall/CRC.</li> <li>- K. A. Stroud and Dexter J. Booth: Engineering Mathematics - Palgrave Macmillan (Publisher) (7th edition, 2013).</li> <li>- James Stewart: Calculus - Cengage Learning (Publisher), (8th edition, 2015).</li> <li>- F. Ayres, E. Mendelson: Schaum's Outline of Calculus. New York: McGraw-Hill, (2013).</li> <li>- G. Strang: Calculus, Wellesley: Wellesley-Cambridge Press, (3<sup>rd</sup> edition, 2017).</li> </ul> |  |  |  |  |

**SIOB101 – Statistics for Engineers**

|                                                   |                                        |  |  |  |  |
|---------------------------------------------------|----------------------------------------|--|--|--|--|
| <b>Module number</b>                              | SIOB101                                |  |  |  |  |
| <b>Module designation according to SPO or SPP</b> | Statistics for Engineers               |  |  |  |  |
| <b>Language</b>                                   | English                                |  |  |  |  |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |  |  |  |  |
| <b>Person responsible for the module</b>          | Prof. Dr. Robert Baumhof               |  |  |  |  |

|                      |                     |  |  |  |  |
|----------------------|---------------------|--|--|--|--|
| <b>Study section</b> | First study section |  |  |  |  |
| <b>Module type</b>   | Mandatory module    |  |  |  |  |
| <b>Module group</b>  | -                   |  |  |  |  |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 2            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 60           | 30                          |                 | 30                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 2            | 1                           | 1               | -                 | -                   |

|                                                       |                                                                                                                                                                 |  |  |  |  |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                                               |  |  |  |  |
| <b>Recommended prerequisites</b>                      | Working through the exercises                                                                                                                                   |  |  |  |  |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |  |  |  |  |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                                |  |  |  |  |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                        |  |  |  |  |
| <b>Proportion of the overall audit result</b>         | 2/486 (see the note on this in section 1.1)                                                                                                                     |  |  |  |  |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <u>Knowledge:</u> <ul style="list-style-type: none"> <li>- Fundamental knowledge of statistical methods relevant to industrial engineering</li> <li>- Understanding of data analysis, probability, probability distributions and statistical inference</li> </ul> <u>Skills and competences:</u> <ul style="list-style-type: none"> <li>- Ability to select and apply appropriate statistical methods to engineering and business problems</li> <li>- Ability to analyze, visualize and interpret data</li> <li>- Ability to evaluate statistical results and derive justified conclusions</li> </ul> |  |  |  |  |
| <b>Contents</b>                                       | <ul style="list-style-type: none"> <li>- Fundamentals of statistics and data collection</li> <li>- Descriptive statistics and data visualization</li> <li>- Probability theory</li> <li>- Discrete and continuous probability distributions</li> <li>- Sampling distributions and the Central Limit Theorem</li> <li>- Statistical estimation and hypothesis testing</li> <li>- Correlation and regression analysis</li> </ul>                                                                                                                                                                        |  |  |  |  |
| <b>Media</b>                                          | Blackboard, overhead projector, tablet PC, calculator, spreadsheet and statistical software                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |  |  |
| <b>Literature</b>                                     | The respective current edition of: <ul style="list-style-type: none"> <li>- Larson, R., &amp; Farber, B. <i>Elementary Statistics: Picturing the World</i>. Pearson.</li> <li>- Navidi, W. C. <i>Statistics for Engineers and Scientists</i>. McGraw-Hill.</li> <li>- Schiefer, H., &amp; Schiefer, F. <i>Statistics for Engineers: An Introduction with Examples from Practice</i>. Springer.</li> <li>- Çetinkaya-Rundel, M., &amp; Hardin, J. <i>Introduction to Modern Statistics</i>. OpenIntro.</li> </ul>                                                                                      |  |  |  |  |

**SIOB110 - Principles of Electrical Engineering**

|                                                   |                                        |
|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB110                                |
| <b>Module designation according to SPO or SPP</b> | Principles of Electrical Engineering   |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Dr. Christin David                     |

|                      |                     |
|----------------------|---------------------|
| <b>Study section</b> | First study section |
| <b>Module type</b>   | Mandatory module    |
| <b>Module group</b>  | -                   |

|                                             |       |                      |          |            |              |
|---------------------------------------------|-------|----------------------|----------|------------|--------------|
| ECTS points                                 | 5     |                      |          |            |              |
| Workload (hours)                            | Total | Course               |          | Self-study |              |
|                                             | 150   | 60                   |          | 90         |              |
| Forms of teaching (semester hours per week) | Total | Seminaristic Lessons | Exercise | Internship | Project work |
|                                             | 4     | 2                    | 2        | -          | -            |

|                                                       |                                                                                                                                                                 |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                                               |
| <b>Recommended prerequisites</b>                      | Basic knowledge of mathematics and physics                                                                                                                      |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                                |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                        |
| <b>Proportion of the overall audit result</b>         | 5/486 (see the note on this in section 1.1)                                                                                                                     |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <p><u>Knowledge:</u></p> <ul style="list-style-type: none"> <li>- Knowledge of the important terms and quantities of electrical engineering from the following four sub-areas: Direct current networks, electric fields, magnetic fields, alternating current networks</li> <li>- Knowledge of the important formulae that relate the electrical engineering quantities to each other (e.g. Ohm's law)</li> </ul> <p><u>Skills and competences:</u></p> <ul style="list-style-type: none"> <li>- Ability to analyze basic electrotechnical facts and express them quantitatively with the help of appropriate formulae and circuit symbols</li> <li>- Ability to check the plausibility of calculation results with qualitative estimations</li> <li>- In-depth understanding of the laws of electrical engineering</li> <li>- Capability of critical evaluation of statements on electrotechnical facts</li> <li>- Capability of further education and deepening in professional practice based on self-selected literature</li> </ul> |
| <b>Contents</b>                                       | <ul style="list-style-type: none"> <li>- DC circuits, Ohm's Law and Kirchhoff's laws</li> <li>- Two-terminal networks and the equivalent circuit method</li> <li>- Electric field, electric induction, capacity, and energy</li> <li>- Magnetic field, magnetic materials, permeability Ampère's law</li> <li>- Electric motor, magnetic circuits, magnetic induction and magnetic forces</li> <li>- Transient processes in the RC and RL circuits, time-dependent quantities</li> <li>- Complex number representation and complex calculations involving AC currents</li> <li>- Active, reactive and actual power</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Media</b>                                          | Tablet PC/beamer, blackboard, overhead projector                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Literature</b>                                     | <ul style="list-style-type: none"> <li>- Warnes, Lionel: Electronic and Electrical Engineering: Principles and Practice. Bloomsbury Publishing.</li> <li>- T. L. Floyd, Principles of Electric Circuits, Pearson, (2016).</li> <li>- J. Nilsson and S. Riedel, Electric Circuits, Pearson, (2014).</li> <li>- C. Alexander and M. Sadiku, Fundamentals of Electric Circuits, McGraw-Hill Education, (2012).</li> <li>- John O'Malley, Schaum's Outline of Basic Circuit Analysis, McGraw-Hill Education, (2011).</li> <li>- Mahmood Nahvi, Schaum's Outline of Electric Circuits, McGraw-Hill Education, (2013).</li> <li>- F. Hüning, The fundamentals of electrical engineering, De Gruyter Oldenbourg, (2014).</li> <li>- R. Prasad, Fundamentals of electrical engineering, PHI learning, (2014).</li> </ul>                                                                                                                                                                                                                        |

**SIOB120 - Fundamentals of Computer Science**

|                                                   |                                        |
|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB120                                |
| <b>Module designation according to SPO or SPP</b> | Fundamentals of Computer Science       |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Dr. Christin David                     |

|                      |                     |
|----------------------|---------------------|
| <b>Study section</b> | First study section |
| <b>Module type</b>   | Mandatory module    |
| <b>Module group</b>  | -                   |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 3                           | 1               | -                 | -                   |

|                                                       |                                                                                                                                                                 |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                                               |
| <b>Recommended prerequisites</b>                      | -                                                                                                                                                               |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                                |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                        |
| <b>Proportion of the overall audit result</b>         | 5/486 (see the note on this in section 1.1)                                                                                                                     |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <u>Knowledge:</u> <ul style="list-style-type: none"> <li>- Knowledge of basic computer science terms</li> <li>- Understanding of the structure of computing systems and how they work</li> <li>- Knowledge about hardware components such as CPU, memory and logic gates</li> <li>- Knowledge about main software components such as operation system</li> <li>- Students know basic elements of an imperative programming language such as variable assignments, data types, if statements and loops</li> </ul> <u>Skills and competences:</u> <ul style="list-style-type: none"> <li>- Students are able to calculate and deal with different number systems</li> <li>- Students are able to analyze Boolean logical expressions</li> <li>- Design, analysis and graphical representation of algorithms</li> </ul> |
| <b>Contents</b>                                       | <u>Computer Engineering:</u> <ul style="list-style-type: none"> <li>- Conversions from a number system; tracing arithmetic operations back to addition; negative and floating-point numbers in binary representation</li> <li>- Development of basic interrelationships for arithmetic and control units in CPUs as well as the structure of memory cells (SRAM/DRAM)</li> <li>- Modern computer architecture including embedded systems</li> </ul> <u>Practical computer science:</u> <ul style="list-style-type: none"> <li>- Software Development Process in Businesses</li> <li>- Aspects of sustainability in hardware and software systems</li> <li>- Operating systems</li> <li>- Basic elements of programming, IDEs</li> </ul>                                                                              |
| <b>Media</b>                                          | Blackboard, overhead projector, beamer, computer examples                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Literature</b>                                     | The respective current edition of: <ul style="list-style-type: none"> <li>- Pozdniakov, Sergei N.: Informatics in Schools. Fundamentals of Computer Science and Software Engineering. Springer International Publishing.</li> <li>- C. Horstmann, C++ for Everyone, Wiley, (2011).</li> <li>- P. Deitel, C++ How to Program (Early Objects Version), Pearson, (2017).</li> <li>- W. Savitch, Problem Solving with C++, Pearson, (2015).</li> <li>- P. Deitel, C: How to Program, Pearson, (2009).</li> <li>- H. Herold, B. Lurz, J. Wohlrab, Grundlagen der Informatik, Pearson, (2007) (in German).</li> </ul>                                                                                                                                                                                                      |

**SIOB130 - Principles of Business Administration and Economics**

|                                                   |                                                     |  |  |  |  |
|---------------------------------------------------|-----------------------------------------------------|--|--|--|--|
| <b>Module number</b>                              | SIOB130                                             |  |  |  |  |
| <b>Module designation according to SPO or SPP</b> | Principles of Business Administration and Economics |  |  |  |  |
| <b>Language</b>                                   | English                                             |  |  |  |  |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule              |  |  |  |  |
| <b>Person responsible for the module</b>          | Prof. Dr. Christof Westerhoven                      |  |  |  |  |

|                      |                     |  |  |  |  |
|----------------------|---------------------|--|--|--|--|
| <b>Study section</b> | First study section |  |  |  |  |
| <b>Module type</b>   | Mandatory module    |  |  |  |  |
| <b>Module group</b>  | -                   |  |  |  |  |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 7            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 210          | 90                          |                 | 120               |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 6            | 6                           | -               | -                 | -                   |

|                                                       |                                                                                                                                                                 |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                                               |
| <b>Recommended prerequisites</b>                      | -                                                                                                                                                               |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                                |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                        |
| <b>Proportion of the overall audit result</b>         | 7/486 (see the note on this in section 1.1)                                                                                                                     |

|                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module aims/learning outcomes/learning outcomes aimed at</b> | <u>Knowledge:</u> <ul style="list-style-type: none"> <li>- Knowledge of basic terms of business administration and economics</li> <li>- Knowledge of the significance and tasks of the operational functional areas as well as the most important economic sectors in the economic cycle and their fundamental interrelationships</li> </ul> <u>Skills:</u> <ul style="list-style-type: none"> <li>- Mastery of elementary business and economic methods</li> </ul> <u>Competences:</u> <ul style="list-style-type: none"> <li>- Ability to assess the complexity of operational and economic processes</li> <li>- Ability to transfer the economic way of thinking to different business and economic situations</li> </ul> |
| <b>Contents</b>                                                 | <u>Business administration:</u> <ul style="list-style-type: none"> <li>- Doing business in a changing world</li> <li>- Starting and growing a business</li> <li>- Managing for quality and competitiveness</li> <li>- Creating the human resource advantage</li> <li>- Develop relationships: brief marketing introduction</li> <li>- Financing the enterprise</li> </ul> <u>Economics:</u> <ul style="list-style-type: none"> <li>- Basic principles of economics, think like an economist</li> <li>- How markets work</li> <li>- Economics of the public sector</li> <li>- Firm behavior and the organization of industry</li> <li>- Labor markets</li> <li>- Macroeconomics</li> <li>- Money and Prices</li> </ul>        |
| <b>Media</b>                                                    | Tablet PC, calculator, camera, blackboard/whiteboard, overhead projector                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Literature</b>                                               | The respective current edition of: <ul style="list-style-type: none"> <li>- Ferrell, O.C.; Hirt, Geoffrey A.; Ferrell, Linda: <i>Business Foundations: A Changing World. International edition</i>, McGraw-Hill/Educating.</li> <li>- Mankiw, N. Gregory: <i>Principles of Economics</i>, Cengage.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                |

**SIOB140 - Sustainable Development I: Principles**

|                                                   |                                        |  |  |  |  |
|---------------------------------------------------|----------------------------------------|--|--|--|--|
| <b>Module number</b>                              | SIOB140                                |  |  |  |  |
| <b>Module designation according to SPO or SPP</b> | Sustainable Development I: Principles  |  |  |  |  |
| <b>Language</b>                                   | English                                |  |  |  |  |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |  |  |  |  |
| <b>Person responsible for the module</b>          | Prof. Dr. Martin Prasch                |  |  |  |  |

|                      |                     |  |  |  |  |
|----------------------|---------------------|--|--|--|--|
| <b>Study section</b> | First study section |  |  |  |  |
| <b>Module type</b>   | Mandatory module    |  |  |  |  |
| <b>Module group</b>  | -                   |  |  |  |  |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 4                           | -               | -                 | -                   |

|                                                       |                                                                                                                                                                 |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                                               |
| <b>Recommended prerequisites</b>                      | -                                                                                                                                                               |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                                |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                        |
| <b>Proportion of the overall audit result</b>         | 5/486 (see the note on this in section 1.1)                                                                                                                     |

|                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module aims/learning outcomes/learning outcomes aimed at</b> | <p><u>Knowledge:</u></p> <ul style="list-style-type: none"> <li>- Concept, dimensions and elements of sustainable development</li> <li>- Earth System incl. biogeochemical processes and global change impacts</li> <li>- Human Behavior and examples of sustainable and non-sustainable development and their preconditions or obstacles</li> <li>- Global industrial flows of energy and material and per capita consumption</li> <li>- Solutions towards sustainability and role of industrial engineering for sustainable development</li> </ul> <p><u>Skills:</u></p> <ul style="list-style-type: none"> <li>- First techniques for the analysis and description of complex systems</li> <li>- Calculations for different forms of energy and its conversion</li> <li>- Understanding of basic industrial material and energy flows</li> <li>- Critically questioning norms, habits and opinions</li> <li>- Reflection on one's own values, views and actions</li> </ul> <p><u>Competences:</u></p> <ul style="list-style-type: none"> <li>- Recognize, explain and communicate the complexity of sustainable development and the physical and socioeconomic mechanisms</li> <li>- Place topics from business and technology in a frame of reference of sustainable development and discuss them with regard to sustainability requirements.</li> <li>- First high-level evaluations of environmental and economic impact of products, solutions, processes etc. and alternatives</li> </ul> |
| <b>Contents</b>                                                 | <ul style="list-style-type: none"> <li>- Concept, dimensions and elements of sustainable development</li> <li>- Earth System incl. biogeochemical processes and global change impacts</li> <li>- Sociocultural evolution, human behavior, and specialties of climate change interventions</li> <li>- Earth System Modelling, global industrial flows, and concept of Planetary Boundaries</li> <li>- Ways towards Sustainable Development and role of industrial engineers</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Media</b>                                                    | Tablet PC with beamer, overhead projector, black and white board; excursions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Literature</b>                                               | <p>The respective current edition of:</p> <ul style="list-style-type: none"> <li>- Turner, David: The Green Marble. Earth System Science and Global Sustainability. Columbia University Press New York. 2018.</li> <li>- Göpel, Maja: The Great Mindshift - How a New Economic Paradigm and Sustainability Transformations go Hand in Hand, Springer Open.</li> <li>- Allwood, Julian; Cullen Jonathan (Ed.): Sustainable Materials. With both eyes open. UIT Cambridge Ltd. 2012.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

**SIOBF10 - German I**

See section 4.

**SIOB150 - Mathematics for Engineers II**

|                                                   |                                        |
|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB150                                |
| <b>Module designation according to SPO or SPP</b> | Mathematics for Engineers II           |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Prof. Dr. Michael Bethke               |

|                      |                     |
|----------------------|---------------------|
| <b>Study section</b> | First study section |
| <b>Module type</b>   | Mandatory module    |
| <b>Module group</b>  | -                   |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 6            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 180          | 90                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 6            | 4                           | 2               | -                 | -                   |

|                                                       |                                                                                                                                                                 |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                                               |
| <b>Recommended prerequisites</b>                      | Mathematics for Engineers I (SIOB100)                                                                                                                           |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                                |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                        |
| <b>Proportion of the overall audit result</b>         | 6/486 (see the note on this in section 1.1)                                                                                                                     |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <u>Knowledge:</u><br>Thorough knowledge of the mathematical terms, laws and analytic and numerical calculation methods relevant to industrial engineering<br><u>Skills and competences:</u> <ul style="list-style-type: none"> <li>- Ability to confidently apply this knowledge to tasks in different professional fields for industrial engineers</li> <li>- Training in practice-oriented mathematical ways of thinking and development of abstraction skills</li> </ul>                                                                                                                                                                                                                                                                                                                                   |
| <b>Contents</b>                                       | <u>Analysis and linear algebra:</u> <ul style="list-style-type: none"> <li>- Integral calculus with one variable</li> <li>- Fourier series</li> <li>- Linear algebra</li> <li>- Differential and integral calculus for functions with several variables</li> <li>- Ordinary differential equations</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Media</b>                                          | Tablet PC, calculator, camera, blackboard/whiteboard, overhead projector                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Literature</b>                                     | The respective current edition of: <ul style="list-style-type: none"> <li>- Croft, Anthony and Davison Robert: Mathematics for engineers. Pearson, 5th edition, 2019</li> <li>- Jeffrey, Alan: Mathematics for Engineers and Scientists. Chapman and Hall/CRC.</li> <li>- K. A. Stroud and Dexter J. Booth: Engineering Mathematics - Palgrave Macmillan (Publisher) (7th edition, 2013).</li> <li>- James Stewart: Calculus - Cengage Learning (Publisher), (8th edition, 2015).</li> <li>- F. Ayres, E. Mendelson: Schaum's Outline of Calculus. New York: McGraw-Hill, (2013).</li> <li>- G. Strang: Calculus, Wellesley: Wellesley-Cambridge Press, (3<sup>rd</sup> edition, 2017).</li> <li>- H. Fox, B. Bolton: Mathematics for engineers and technologists, . Butterworth-Heinemann (2002).</li> </ul> |

**SIOB160 - Applied Physics**

|                                                   |                                        |
|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB160                                |
| <b>Module designation according to SPO or SPP</b> | Applied Physics                        |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Dr. Christin David                     |

|                      |                     |
|----------------------|---------------------|
| <b>Study section</b> | First study section |
| <b>Module type</b>   | Mandatory module    |
| <b>Module group</b>  | -                   |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 7            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 210          | 90                          |                 | 120               |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 6            | 4                           | 2               | -                 | -                   |

|                                                       |                                                                                                                                                                 |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                                               |
| <b>Recommended prerequisites</b>                      | Modules "Mathematics for Engineers I" (SIOB100) and "Principles of Electrical Engineering" (SIOB110)                                                            |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                                |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                        |
| <b>Proportion of the overall audit result</b>         | 7/486 (see the note on this in section 1.1)                                                                                                                     |

|                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module aims/learning outcomes/learning outcomes aimed at</b> | <u>Knowledge:</u> <ul style="list-style-type: none"> <li>- Basic understanding of mechanics, material science, thermodynamics, wave phenomena and optics</li> <li>- Application of physical laws to the solution of real-world problems</li> </ul> <u>Skills and competences:</u> <ul style="list-style-type: none"> <li>- Ability to correctly identify and categorize the physics of technical applications</li> <li>- Ability to identify acting forces and applicable conservation laws</li> <li>- Capability to analyze and visualize physical equations</li> <li>- Skills in carrying out simple physical calculations</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Contents</b>                                                 | <u>Mechanics and conservation laws:</u> <ul style="list-style-type: none"> <li>- Inertial forces, centrifugal force, Coriolis force, mechanical work, forms of energy, conservation of energy, conservation of momentum, elastic and inelastic collisions, conservation of angular momentum, conservation of charge, conservation of mass</li> </ul> <u>The structure of matter:</u> <ul style="list-style-type: none"> <li>- Atomic models, elementary particles, chemical elements, atomic bonds, molecules, crystals, states of matter, solids, metals, ceramics, amorphous solids, polymers, composite materials, liquids, hydrostatics and hydrodynamics, surface tension, capillary effect, gases, atmosphere</li> </ul> <u>Thermodynamics:</u> <ul style="list-style-type: none"> <li>- Temperature, scales, kinetic-molecular theory, ideal-gas law, heat, the laws of thermodynamics, thermodynamic processes, cyclic processes, heat engines and motors</li> </ul> <u>Harmonic oscillations and waves:</u> <ul style="list-style-type: none"> <li>- 1D harmonic motion, damped and forced oscillations, wave equation, harmonic waves, reflection, standing waves, sound, perception of sound, sound level, Doppler effect, interference and diffraction</li> </ul> <u>Geometric and Wave Optics:</u> <p>Light spectrum; refraction, transmission, reflection at surfaces, total reflection, polarization, lenses, optical instruments, interference, diffraction</p> |
| <b>Media</b>                                                    | Tablet-PC and Projector, demonstration experiments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Literature</b>                                               | <ul style="list-style-type: none"> <li>- Cutnell, John D. / Johnson, Kenneth W.: Physics, John Wiley and Sons.</li> <li>- Serway, Raymond A. / Jewett, John W.: Physics for Scientists and Engineers, Brooks/Cole.</li> <li>- H. Goldstein, C. Poole, J. Safko, Classical Mechanics, Addison Wesley.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

**SIOB170 - Electronics and Measurement Engineering**

|                                                   |                                         |
|---------------------------------------------------|-----------------------------------------|
| <b>Module number</b>                              | SIOB170                                 |
| <b>Module designation according to SPO or SPP</b> | Electronics and Measurement Engineering |
| <b>Language</b>                                   | English                                 |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule  |
| <b>Person responsible for the module</b>          | Dr. Christin David                      |

|                      |                     |
|----------------------|---------------------|
| <b>Study section</b> | First study section |
| <b>Module type</b>   | Mandatory module    |
| <b>Module group</b>  | -                   |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 2                           | 2               |                   | -                   |

|                                                       |                                                                                                                                                                 |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                                               |
| <b>Recommended prerequisites</b>                      | Successful completion of the modules "Principles of Electrical Engineering" (SIOB110), "Fundamentals of Computer Science" (SIOB120)                             |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                                |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                        |
| <b>Proportion of the overall audit result</b>         | 5/486 (see the note on this in section 1.1)                                                                                                                     |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <p><u>Knowledge:</u></p> <ul style="list-style-type: none"> <li>- Knowing about the design and fabrication of electronic devices</li> <li>- Description of electrical components by characteristic curves</li> <li>- Knowing important limit values and temperature effects</li> <li>- Description of the physics and electrical function of semiconductor components</li> <li>- Description of basic circuits of power electronics</li> <li>- Description of the conversion between analogue and digital signals</li> <li>- Knowing the basics and simple circuits of digital technology</li> </ul> <p><u>Skills and competences:</u></p> <ul style="list-style-type: none"> <li>- Students are familiar with the concepts of electronics and measurement technology and can assess these independently in their later engineering practice in their professional field</li> <li>- Application of laws about limit values to component selection</li> <li>- Analyze and draw simple circuits</li> <li>- Dealing with formulas, calculation methods and data sheets</li> <li>- Application of graphical methods based on characteristic curves</li> <li>- Evaluation of digitization in terms of dynamics and sampling frequency</li> <li>- Optimizing logic circuits with regard to the number of gates</li> </ul> |
| <b>Contents</b>                                       | <ul style="list-style-type: none"> <li>- Production of electronic circuits (development, electronic design automation, PCB, interconnection technologies, soldering)</li> <li>- Limit values (safe operating area, thermal resistance, data sheets, heat sinks)</li> <li>- Diode (Shockley equation, characteristic curve, designs, half-wave rectifier, bridge rectifier, smoothing capacitor, light-emitting diode, photodiode, solar cell)</li> <li>- MOSFET (function, characteristic curve, limit values, data sheets, designs, switch for resistive and inductive loads, amplifier)</li> <li>- Digital technology (logic gates, switching networks, control units)</li> <li>- Operational amplifier (function of ideal/real op-amp, principle of negative feedback, non-inverting/inverting amplifier, summer, integrator, differentiator. Cut-off frequency, slew rate)</li> <li>- Analogue-to-digital converter/digital-to-analogue converter (mode of operation, quantization error, sampling theorem)</li> </ul>                                                                                                                                                                                                                                                                                          |
| <b>Media</b>                                          | Visualizers, illustrative models, experimental demonstrations, simulations, videos, exercises, homework                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Literature</b>                                     | Comprehensive lecture notes from Landshut University of Applied Sciences, selected data sheets (both will be made available via Moodle).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

**SIOB180 - Software Development and Coding**

|                                                   |                                        |
|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB180                                |
| <b>Module designation according to SPO or SPP</b> | Software Development and Coding        |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Dr. Christin David                     |

|                      |                     |
|----------------------|---------------------|
| <b>Study section</b> | First study section |
| <b>Module type</b>   | Mandatory module    |
| <b>Module group</b>  | -                   |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 2                           | 2               |                   | -                   |

|                                                       |                                                                                                                                                                 |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                                               |
| <b>Recommended prerequisites</b>                      | Fundamentals of Computer Science (SIOB120)                                                                                                                      |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                                |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                        |
| <b>Proportion of the overall audit result</b>         | 5/486 (see the note on this in section 1.1)                                                                                                                     |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <u>Knowledge:</u> <ul style="list-style-type: none"> <li>- Knowledge and application of the software development process</li> <li>- Knowledge of the structure, outputs and results of a compiled programming language</li> </ul> <u>Skills and competences:</u> <ul style="list-style-type: none"> <li>- Ability to write simple and complex programs in the procedural language C</li> <li>- Ability to deal with a modern integrated development environment (IDE) including AI support</li> <li>- Programming a microcontroller with a company-specific IDE</li> <li>- Ability to work on complex algorithms and applications in teams</li> </ul>                                                                                                                                                                                                                                                                                        |
| <b>Contents</b>                                       | <u>Programming in C:</u> <ul style="list-style-type: none"> <li>- Green Computing Practices: Aspects of sustainability in programming</li> <li>- Input and output and elementary instructions</li> <li>- Expressions, precedence, evaluation sequence, blocks</li> <li>- Operators and preprocessor</li> <li>- Functions and parameter transfer</li> <li>- Control structures, arrays and pointers</li> <li>- Complex data types and data structures;</li> <li>- Algorithms for advanced topics (sorting algorithms)</li> <li>- Important functions of the standard and mathematical library;</li> <li>- File and error handling</li> </ul> <u>Programming a microcontroller:</u> <ul style="list-style-type: none"> <li>- Working with a specific IDE</li> <li>- Building simple circuits on a breadboard</li> <li>- Controlling a motor, LEDs, light sensors, sound output</li> <li>- Measuring, exporting and visualizing data</li> </ul> |
| <b>Media</b>                                          | Blackboard, overhead projector, beamer, computer examples                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Literature</b>                                     | The respective current edition of: <ul style="list-style-type: none"> <li>- Schmidt, Richard: Software engineering. Architecture-driven software development. (Elsevier, 2013).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

**SIOBF20 - German II**

See section 4.

**2.2 Compulsory modules in the 3rd and 4th semester****SIOB190 - Automatic Control Engineering**

|                                                   |                                        |
|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB190                                |
| <b>Module designation according to SPO or SPP</b> | Automatic Control Engineering          |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Prof. Dr. Michael Bethke               |

|                      |                      |
|----------------------|----------------------|
| <b>Study section</b> | Second study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 2                           | 2               | -                 | -                   |

|                                                      |                                                                                                                                                                 |
|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific requirements according to SPO</b> | -                                                                                                                                                               |
| <b>Recommended prerequisites</b>                     | Principles of Electrical Engineering (SIOB110), Fundamentals of Computer Science (SIOB120) and Software Development and Coding (SIOB180)                        |
| <b>Exam</b>                                          | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>     | See semester-specific study and examination plan                                                                                                                |
| <b>Evaluation of the examination performance</b>     | Endnotes                                                                                                                                                        |
| <b>Proportion of the overall audit result</b>        | 20/486 (see the note on this in section 1.1)                                                                                                                    |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <p><u>Knowledge:</u></p> <ul style="list-style-type: none"> <li>- Knowledge of basic automation technology terms and the importance of automation technology and its possible applications</li> <li>- Understanding of the structure of automation systems and their how it works and knowledge of the benefits of automating systems and the</li> <li>- Challenges in the implementation</li> </ul> <p><u>Skills:</u></p> <ul style="list-style-type: none"> <li>- The students apply their knowledge to make a rough planning</li> <li>- of simple automation systems.</li> <li>- Their knowledge also enables them to design and implement simple PLC programs.</li> </ul> <p><u>Competences:</u></p> <ul style="list-style-type: none"> <li>- Students will be able to analyze technical processes and evaluate the feasibility of automation.</li> <li>- They are able to estimate the effort required for implementation.</li> </ul> |
| <b>Contents</b>                                       | <ul style="list-style-type: none"> <li>- Importance of automation and automation objects</li> <li>- Design of automation systems and requirements for them</li> <li>- Variance in processes</li> <li>- Functionality of automation computers, state machines</li> <li>- Interfaces of the automation computers to the process</li> <li>- Industrial communication technology, real-time capability</li> <li>- Structure and function of a PLC, cyclic program processing and response time</li> <li>- Addressing inputs, outputs and the memory, storing functions, edges and timers</li> <li>- Basics of programming languages</li> <li>- Basics of P, PI and PID-Controllers, filters</li> <li>- Basic of robotics, AGVs and AMRs</li> </ul>                                                                                                                                                                                             |
| <b>Media</b>                                          | Blackboard, beamer, camera, hardware and software                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Literature</b>                                     | Kulczycki, Piotr: Automatic Control, Robotics, and Information Processing. Springer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

**SIOB200 - Fundamentals of Industrial Digitization**

|                                                   |                                         |
|---------------------------------------------------|-----------------------------------------|
| <b>Module number</b>                              | SIOB200                                 |
| <b>Module designation according to SPO or SPP</b> | Fundamentals of Industrial Digitization |
| <b>Language</b>                                   | English                                 |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule  |
| <b>Person responsible for the module</b>          | Prof. Dr. Eduard Bröcker                |

|                      |                      |
|----------------------|----------------------|
| <b>Study section</b> | Second study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 2                           | 2               | -                 | -                   |

|                                                       |                                                                                                                                                                 |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                                               |
| <b>Recommended prerequisites</b>                      | Fundamentals of Computer Science (SIOB120)                                                                                                                      |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                                |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                        |
| <b>Proportion of the overall audit result</b>         | 20/486                                                                                                                                                          |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <p>The students gain knowledge in the field of networks for data and telecommunications with deeper focus on the tools and concepts of IoT and application areas</p> <p><u>The students acquire the following skills and competences:</u></p> <ul style="list-style-type: none"> <li>- identify communication protocols</li> <li>- describe technologies used for data communication and mobile communication</li> <li>- understanding differences between technologies and protocols</li> <li>- describe technological basics of the Internet of Things (IoT)</li> <li>- describing the use of IoT and outline data communication</li> </ul> |
| <b>Contents</b>                                       | <ul style="list-style-type: none"> <li>- Fundamentals of Standards on the Internet: History, organization, committees, standards.</li> <li>- Basics of computer networks: ISO/OSI reference model, protocols of the TCP/IP stack, DNS, HTTP</li> <li>- Local area networks: Ethernet, WAN, WIFI</li> <li>- Telecommunication: DSL, Fiber and mobile communication (e.g. GSM, VoIP, LTE)</li> <li>- concepts and tools of IoT: The main current application areas; elements of networking; typical actuators and sensors; protocols (esp. MQTT) and interoperability Industry 4.0, etc) to be implemented.</li> </ul>                          |
| <b>Media</b>                                          | Tablet PC/projector, blackboard or whiteboard, flip chart, videos                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Literature</b>                                     | <p>The latest issue of:</p> <ul style="list-style-type: none"> <li>- Halsall, Fred: Computer Networking and the Internet, Addison-Wesley</li> <li>- McEwen, Adrian; Cassimally, Hakim: Designing the Internet of Things, John Wiley &amp; Sons</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                     |

**SIOB210 - Fundamentals of Operations and Supply Chains**

|                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |                 |                   |                     |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>Module number</b>                                            | SIOB210                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                             |                 |                   |                     |
| <b>Module designation according to SPO or SPP</b>               | Fundamentals of Operations and Supply Chains                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                             |                 |                   |                     |
| <b>Language</b>                                                 | English                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                             |                 |                   |                     |
| <b>Lecturer</b>                                                 | See semester-specific lecture schedule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                             |                 |                   |                     |
| <b>Person responsible for the module</b>                        | Prof. Dr. Martin Prasch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                             |                 |                   |                     |
| <b>Study section</b>                                            | Second study section                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                             |                 |                   |                     |
| <b>Module type</b>                                              | Mandatory module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                 |                   |                     |
| <b>Module group</b>                                             | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                             |                 |                   |                     |
| <b>ECTS points</b>                                              | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                             |                 |                   |                     |
| <b>Workload (hours)</b>                                         | <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                                 | 210                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 90                          |                 | 120               |                     |
| <b>Forms of teaching (semester hours per week)</b>              | <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                                 | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 4                           | 2               | -                 | -                   |
| <b>Module-specific prerequisites according to SPO</b>           | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                             |                 |                   |                     |
| <b>Recommended prerequisites</b>                                | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                             |                 |                   |                     |
| <b>Exam</b>                                                     | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |                 |                   |                     |
| <b>Admission requirement for the examination</b>                | See semester-specific study and examination plan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                 |                   |                     |
| <b>Evaluation of the examination performance</b>                | Endnotes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |                 |                   |                     |
| <b>Proportion of the overall audit result</b>                   | 28/486                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                             |                 |                   |                     |
| <b>Module aims/learning outcomes/learning outcomes aimed at</b> | <p><u>Knowledge:</u></p> <ul style="list-style-type: none"> <li>- Overview of operational processes of industrial production of goods &amp; services</li> <li>- Fundamentals of procurement and purchasing</li> <li>- Knowledge of the different production types &amp; of basic manufacturing strategies</li> <li>- Knowledge of production planning and control processes</li> <li>- Basic knowledge of logistics: from transport systems to internal and cross-company integrating supply chains</li> </ul> <p><u>Skills:</u></p> <ul style="list-style-type: none"> <li>- Performing ABC analysis, BoM explosion</li> <li>- Performing forecasts</li> <li>- Calculation of cost of goods and supply chains</li> <li>- Calculating capacities and scheduling basic operations</li> <li>- Layout planning</li> <li>- Calculation of optimal lot sizes and through put time</li> </ul> <p><u>Competences:</u></p> <ul style="list-style-type: none"> <li>- Solve basic operations tasks and problems</li> <li>- Discuss adjustment decisions in practices</li> </ul> |                             |                 |                   |                     |
| <b>Contents</b>                                                 | <ul style="list-style-type: none"> <li>- Basics, incl. the productivity challenge and importance of innovation</li> <li>- Forecasting</li> <li>- Design of Goods and Services and Sustainability in Supply Chain</li> <li>- Managing Quality</li> <li>- Process Strategy and Capacity Planning</li> <li>- Location and layout strategies</li> <li>- HR Management in Operations</li> <li>- Logistics Management</li> <li>- Supply Chain Management &amp; Procurement</li> <li>- Inventory Management</li> <li>- Aggregated Planning – S&amp;OP and ERP</li> <li>- Short-Term Scheduling</li> <li>- Intro to Lean Operations</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                |                             |                 |                   |                     |
| <b>Media</b>                                                    | Tablet PC/projector, blackboard, flip chart                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |                 |                   |                     |
| <b>Literature</b>                                               | <ul style="list-style-type: none"> <li>- Heizer, Jay; Render, Barry: Operations Management. Global edition. Pearson Education Limited.</li> <li>- Grant, David, et. Al.: Sustainable Logistics and Supply Chain Management. Global Edition. Pearson.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |                 |                   |                     |

**SIOB220 - Marketing and Sales**

|                                                   |                                        |
|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB220                                |
| <b>Module designation according to SPO or SPP</b> | Marketing and Sales                    |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Prof. Dr. Christof Westerhoven         |

|                      |                      |
|----------------------|----------------------|
| <b>Study section</b> | Second study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 4                           | -               | -                 | -                   |

|                                                       |                                                                                                                                                                 |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                                               |
| <b>Recommended prerequisites</b>                      | Module "Principles of Business Administration and Economics" (SIOB130)                                                                                          |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                                |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                        |
| <b>Proportion of the overall audit result</b>         | 20/486                                                                                                                                                          |

|                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module aims/learning outcomes/learning outcomes aimed at</b> | Upon completion of the module, students know the basic concepts of marketing and are able to understand and analyze markets and customer behavior in B2B and B2C markets. Based on this knowledge, they are able to explain and apply marketing core tasks (4Ps) in a given context/for a given case. The students understand the structure, processes and the interdependencies within sales and are able to describe and evaluate specific sales tasks.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Contents</b>                                                 | <ul style="list-style-type: none"> <li>- Basic terms and concepts of marketing</li> <li>- Marketing as a management process</li> <li>- Development of marketing strategies</li> <li>- Methods of market research</li> <li>- Product management and pricing decisions</li> <li>- Communication and distribution management decisions</li> <li>- Design of the marketing organization</li> <li>- Marketing controlling</li> <li>- Sales management in the twenty-first century</li> <li>- The sales program: process of selling and buying, linking strategies in the era of CRM and data, organizing the sales effort, strategic role of information in sales management</li> <li>- Implementation of the sales program: behavior and role of the salesperson, motivation, sales force recruitment, salesperson compensation and incentives</li> <li>- Evaluation and control of the sales program: cost analysis, evaluating salesperson performance</li> </ul> |
| <b>Media</b>                                                    | Tablet PC / beamer, e-learning (Moodle platform of the HS), blackboard, flipchart                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Literature</b>                                               | <p>The latest issue of:</p> <ul style="list-style-type: none"> <li>- Bruhn, Manfred: <i>Principles of Marketing. A Comprehensive Introduction for Students and Practitioners</i>. Springer Nature</li> <li>- Johnston, Mark W.; Marshall, Greg W.: <i>Sales Force Management. Leadership, Innovation, Technology</i>. Routledge</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

**SIOB230 - Accounting**

|                                                   |                                        |
|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB230                                |
| <b>Module designation according to SPO or SPP</b> | Accounting                             |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Prof. Dr. Christof Westerhoven         |

|                      |                      |
|----------------------|----------------------|
| <b>Study section</b> | Second study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 2                           | 2               | -                 | -                   |

|                                                       |                                                                                                                                                                 |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                                               |
| <b>Recommended prerequisites</b>                      | Successful completion of the module "Principles of Business Administration and Economics" (SIOB130)                                                             |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                                |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                        |
| <b>Proportion of the overall audit result</b>         | 20/486                                                                                                                                                          |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <ul style="list-style-type: none"> <li>- Differentiate between financial accounting and management accounting</li> <li>- Understanding of the booking techniques and the corresponding journal and general ledger entries</li> <li>- Understanding of the accounting principles</li> <li>- Year-end closing</li> <li>- Analyze and evaluate the financial statements of companies</li> </ul>                                                                                                                     |
| <b>Contents</b>                                       | <p>Introduction to:</p> <ul style="list-style-type: none"> <li>- The accounting process</li> <li>- Financial accounting and adjusting entries</li> <li>- The classified balance sheet and related disclosures</li> <li>- Accounting for the sale of goods</li> <li>- Assigning costs to merchandise</li> <li>- Cash and receivables</li> <li>- Long-lived assets</li> <li>- Debt financing</li> <li>- Equity financing</li> <li>- The statement of cash flows</li> <li>- Financial statement analysis</li> </ul> |
| <b>Media</b>                                          | Tablet PC with beamer, overhead projector, blackboard                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Literature</b>                                     | <p>The respective current edition of:</p> <ul style="list-style-type: none"> <li>- Dauderis, Henry; Annand, David: <i>Introduction to Financial Accounting</i>. Vretta-Lyryx</li> </ul>                                                                                                                                                                                                                                                                                                                          |

**SIOBF30 - German III**

See section 4.

**SIOB240 - Engineering and Design**

|                                                   |                                        |
|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB240                                |
| <b>Module designation according to SPO or SPP</b> | Engineering and Design                 |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Prof. Dr. Robert Baumhof               |

|                      |                      |
|----------------------|----------------------|
| <b>Study section</b> | Second study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 3                           | 1               | -                 | -                   |

|                                                       |                                                                                                                                                                 |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                                               |
| <b>Recommended prerequisites</b>                      | Introduction to Manufacturing Engineering (SIOB250)                                                                                                             |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                                |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                        |
| <b>Proportion of the overall audit result</b>         | 20/486                                                                                                                                                          |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <p><u>Students have knowledge of:</u></p> <ul style="list-style-type: none"> <li>– fundamentals of engineering design and structured product development processes,</li> <li>– engineering materials, standard components, and manufacturing processes,</li> <li>– technical drawing, dimensioning, tolerancing, and fits,</li> <li>– systematic design methods, Design Thinking, and prototyping,</li> <li>– sustainability assessment (LCA, carbon footprint) and Design for X approaches,</li> <li>– supply chain integration, cost engineering, and business case development,</li> </ul> <p><u>Students are able to:</u></p> <ul style="list-style-type: none"> <li>– analyze products systematically across engineering, sustainability, cost, and compliance dimensions,</li> <li>– select materials, components, and processes based on functional, economic, and sustainability criteria,</li> <li>– apply design methods (VDI 2221, morphological matrix, Design Thinking) to generate and evaluate concepts,</li> <li>– conduct DfMA analysis, FMEA, and simplified LCA for engineering design decisions,</li> <li>– build a cost-benefit case for sustainable design and navigate regulatory requirements.</li> </ul> |
| <b>Contents</b>                                       | <ul style="list-style-type: none"> <li>- Introduction to engineering design; product development processes (Stage-Gate, V-Model, Agile); requirements engineering; user-centered design and ergonomics.</li> <li>- Engineering materials and sustainable selection; circular material flows; standard components (mechanical, electrical, electronic) and specification.</li> <li>- Manufacturing processes; Design for Manufacturing and Assembly (DfMA); technical drawing and tolerancing (GD&amp;T, ISO fits).</li> <li>- Systematic design methods and TRIZ; Design Thinking and creative problem solving; prototyping and testing; systems engineering.</li> <li>- FMEA, reliability, and quality by design; sustainability assessment (LCA, PCF, circularity metrics); Design for X (DfRecycling, DfRepair, DfLongevity, DfEnergy Efficiency).</li> <li>- Supply chain integration and responsible sourcing; cost engineering, target costing, TCO, and business case; regulatory compliance, Digital Product Passport, and IP strategy.</li> </ul>                                                                                                                                                                        |
| <b>Media</b>                                          | Computer/beamer, blackboard, overhead projector                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

|                   |                                                                                                                                                                                                                                                                                                     |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Literature</b> | Pahl, G.; Beitz, W.; Feldhusen, J.; Grote, K.-H. — <i>Engineering Design: A Systematic Approach</i> — Springer.<br>Ulrich, K. T.; Eppinger, S. D.; Yang, M. C. — <i>Product Design and Development</i> — McGraw-Hill.<br>Ashby, M. F. — <i>Materials Selection in Mechanical Design</i> — Elsevier. |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**SIOB250 - Introduction to Manufacturing Engineering**

|                                                   |                                           |
|---------------------------------------------------|-------------------------------------------|
| <b>Module number</b>                              | SIOB250                                   |
| <b>Module designation according to SPO or SPP</b> | Introduction to Manufacturing Engineering |
| <b>Language</b>                                   | English                                   |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule    |
| <b>Person responsible for the module</b>          | Prof. Dr. Martin Prasch                   |

|                      |                      |
|----------------------|----------------------|
| <b>Study section</b> | Second study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 4                           | -               | -                 | -                   |

|                                                       |                                                                                                                                                                 |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                                               |
| <b>Recommended prerequisites</b>                      | -                                                                                                                                                               |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                                |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                        |
| <b>Proportion of the overall audit result</b>         | 20/486                                                                                                                                                          |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <p><u>Knowledge:</u></p> <ul style="list-style-type: none"> <li>- Classification of discrete manufacturing processes</li> <li>- Basics of material sciences, material properties, from design to manufacturing</li> <li>- Knowledge of the cost drivers of the above-mentioned manufacturing processes</li> <li>- Knowledge of important boundary conditions and restrictions of the above-mentioned manufacturing processes, esp. considering quantities and tolerances</li> <li>- Knowledge of the possibilities for scaling the above-mentioned production processes with regard to output quantity and workpiece size as well as flexibility with regard to variants.</li> </ul> <p><u>Skills:</u></p> <ul style="list-style-type: none"> <li>- Analysis of technical drawings with regard to essential product features determining the manufacturing process chain</li> <li>- Analysis of job data with regard to information relevant for work system design</li> <li>- Analysis and development of manufacturing costs with given design and business inputs</li> </ul> <p><u>Competences:</u></p> <ul style="list-style-type: none"> <li>- Ability to derive fundamentally suitable manufacturing methods and processing chains for typical workpieces on the basis of important product-determining data and order data</li> <li>- Ability to determine the production type and process principle on the basis of essential order data and product structure features and business parameters</li> </ul> |
| <b>Contents</b>                                       | <ul style="list-style-type: none"> <li>- Introduction &amp; Definition of Manufacturing</li> <li>- Basics of Material Science for Manufacturing Engineering; Chemical &amp; molecular basis; properties; types; examples; characteristics; tolerances</li> <li>- Historic Development and Classification of Manufacturing Processes and Systems</li> <li>- Solidification Processes; Principles; metal casting; glass working; plastic molding; composite manufacturing</li> <li>- Particulate Processing of Metals, Ceramics, Plastics and Additive Manufacturing; Power metallurgy; processing of ceramics and cements; additive manufacturing</li> <li>- Metal Forming and Sheet Metalworking; Fundamentals; bulk deformation; sheet metal working</li> <li>- Material Removal Processes; Classification, machining, cutting, grinding, machine tools, others</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   | <ul style="list-style-type: none"> <li>- Property Enhancing and Surface Processing Operations; heat treatment; coating and surface processing</li> <li>- Joining and Assembly Processes; classification; welding, brazing and soldering; adhesive bonding, mechanical fasteners</li> <li>- Special Manufacturing Types and Assembly Systems; microfabrication and nanofabrication technologies; components of assembly systems; operations of assembly; final considerations on sustainability in manufacturing</li> </ul> |
| <b>Media</b>      | PC/beamer, blackboard, videos                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Literature</b> | <p>The respective current edition of:</p> <ul style="list-style-type: none"> <li>- Nee, Andrew: Handbook of Manufacturing Engineering and Technology. Springer</li> <li>- Groover, Mikell: Introduction to Manufacturing Engineering Processes. Wiley</li> <li>- Groover, Mikell: Fundamentals of Modern Manufacturing. Wiley</li> </ul>                                                                                                                                                                                   |

**SIOB260 - Renewable Energy**

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|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB260                                |
| <b>Module designation according to SPO or SPP</b> | Renewable Energy                       |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Prof. Dr. Robert Baumhof               |

|                      |                      |
|----------------------|----------------------|
| <b>Study section</b> | Second study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 4                           | -               | -                 | -                   |

|                                                       |                                                                                                                                                                 |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                                               |
| <b>Recommended prerequisites</b>                      | -                                                                                                                                                               |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                                |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                        |
| <b>Proportion of the overall audit result</b>         | 20/486                                                                                                                                                          |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <ul style="list-style-type: none"> <li>- The students know the basics of energy systems, the technical and economic characteristics of conventional and renewable energy sources, and the drivers behind the energy transition at each value creation stage.</li> <li>- They are able to apply economic and environmental criteria in the procurement, conversion, transport, and delivery of heat and electrical energy.</li> <li>- Based on what they have learned, students can work on case studies in a practical and interactive way.</li> <li>- They understand why the transition from conventional to renewable energy is necessary and can assess the technical potential, limitations, and benefits of different renewable energy technologies.</li> <li>- They have knowledge of the structure, regulation, and market mechanisms of the liberalized energy industry with a focus on the electricity and heat sector.</li> <li>- They can evaluate energy systems in terms of efficiency, carbon intensity, cost, and integration into future energy infrastructure.</li> </ul> |
| <b>Contents</b>                                       | <ul style="list-style-type: none"> <li>- Energy basics: forms of energy, conversion principles, efficiency, energy balances</li> <li>- Conventional energy production: fossil and nuclear – why the energy transition is necessary</li> <li>- Fundamentals of the energy industry: value chain, market structure, stakeholders</li> <li>- Liberalized electricity market: unbundling, EEX, spot and derivatives markets, merit order</li> <li>- Generation and transport of electricity: load curves, grid structure, storage</li> <li>- Renewable energy sources: solar (PV, solar thermal), wind (onshore, offshore), hydropower, biomass and biogas, geothermal energy</li> <li>- Heat pumps: operating principles, types, COP, sector coupling</li> <li>- Contracts, pricing, and support mechanisms (EEG, PPA, market premium)</li> <li>- Energy law framework: key regulations in Germany and the EU</li> <li>- System integration of renewables: variability, storage, sector coupling, hydrogen</li> </ul>                                                                          |
| <b>Media</b>                                          | Tablet PC with beamer, overhead projector, blackboard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Literature</b>                                     | <p>The respective current edition of:</p> <ul style="list-style-type: none"> <li>- Twidell, John; Weir, Tony: Renewable Energy Resources. Routledge, London/New York.</li> <li>- Quaschnig, Volker: Understanding Renewable Energy Systems. Routledge, London.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"><li>- Quaschnig, Volker: Regenerative Energiesysteme. Carl Hanser Verlag, München.</li><li>- Kaltschmitt, Martin; Streicher, Wolfgang; Wiese, Andreas (Hrsg.): Renewable Energy: Technology, Economics and Environment. Springer, Berlin/Heidelberg.</li><li>- Sterner, Michael; Stadler, Ingo: Energiespeicher – Bedarf, Technologien, Integration. Springer.</li><li>- Zahoransky, Rudolf et al.: Energietechnik – Systeme zur konventionellen und erneuerbaren Energieumwandlung. Springer Vieweg.</li></ul> |
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**SIOB270 - Sustainable development II: Standards, Players, Interventions**

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|---------------------------------------------------|---------------------------------------------------------------|
| <b>Module number</b>                              | SIOB270                                                       |
| <b>Module designation according to SPO or SPP</b> | Sustainable development II: Standards, Players, Interventions |
| <b>Language</b>                                   | English                                                       |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule                        |
| <b>Person responsible for the module</b>          | Prof. Dr. Robert Baumhof                                      |

|                      |                      |
|----------------------|----------------------|
| <b>Study section</b> | Second study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 2                           | 2               | -                 | -                   |

|                                                       |                                                                                                                                                                 |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                                               |
| <b>Recommended prerequisites</b>                      | Successful completion of the module: Sustainable Development I: Principles                                                                                      |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: written exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                                |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                        |
| <b>Proportion of the overall audit result</b>         | 20/486                                                                                                                                                          |

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|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Goals / Learning Outcomes</b> | <p><u>Knowledge:</u><br/>Students have knowledge of:</p> <ul style="list-style-type: none"> <li>- standards, players and interventions in sustainable development;</li> <li>- ecological, social and economic sustainability objectives;</li> <li>- stakeholder management, corporate social responsibility and sustainability governance;</li> <li>- sustainability and greenhouse-gas reporting;</li> <li>- life cycle assessment, circular economy and waste management;</li> <li>- relevant standards, frameworks, institutions and regulatory actors.</li> </ul> <p><u>Skills and Competences:</u><br/>Students are able to:</p> <ul style="list-style-type: none"> <li>- analyze interactions between sustainability standards, players and interventions;</li> <li>- identify and assess stakeholders, interests and responsibilities;</li> <li>- evaluate corporate sustainability strategies, reports and greenhouse-gas inventories;</li> <li>- apply basic principles of life cycle assessment, circular economy and waste management;</li> <li>- develop and justify sustainability interventions;</li> <li>- integrate ecological, social and economic perspectives;</li> <li>- contribute to inter- and transdisciplinary sustainability processes.</li> </ul> |
| <b>Contents</b>                         | <p><u>Standards:</u></p> <ul style="list-style-type: none"> <li>- Ecological carrying capacity, planetary boundaries and tipping points</li> <li>- Social equity, justice, participation and responsibility</li> <li>- Economic performance, prosperity and limits to growth</li> <li>- Sustainability standards, regulation and reporting frameworks</li> <li>- Corporate social responsibility</li> <li>- Sustainability reporting and greenhouse-gas accounting</li> </ul> <p><u>Players:</u></p> <ul style="list-style-type: none"> <li>- Stakeholder management and stakeholder engagement</li> <li>- Civil society, policy, science, individuals and companies</li> <li>- Standardization, certification and reporting organizations</li> <li>- Interests, responsibilities, power relations and conflicts</li> </ul> <p><u>Interventions:</u></p> <ul style="list-style-type: none"> <li>- Cultural, political, institutional, economic and technological interventions</li> <li>- Corporate sustainability strategies and sustainable business models</li> <li>- Life cycle assessment and life cycle thinking</li> </ul>                                                                                                                                            |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   | <ul style="list-style-type: none"> <li>- Circular-economy strategies</li> <li>- Waste hierarchy and waste management</li> <li>- Application examples, trade-offs and transformation scenarios</li> <li>- Outlook: Transformations and future scenarios</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Media</b>      | Tablet PC with beamer, overhead projector, black and white board                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Literature</b> | <p>The respective current edition of:</p> <ul style="list-style-type: none"> <li>– Hahn, R.: Sustainability Management: Concepts, Instruments, and Stakeholders. Pearson.</li> <li>– Costanza, R. et al.: An Introduction to Ecological Economics. CRC Press.</li> <li>– Göpel, M.: The Great Mindshift. Springer International Publishing.</li> <li>– Ostrom, E.: Governing the Commons. Cambridge University Press.</li> <li>– Freeman, R. E.: Strategic Management: A Stakeholder Approach. Cambridge University Press.</li> <li>– WRI &amp; WBCSD: The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard.</li> <li>– Hauschild, M. Z., Rosenbaum, R. K. &amp; Olsen, S. I. (eds.): Life Cycle Assessment: Theory and Practice. Springer.</li> <li>– Stahel, W. R.: The Circular Economy: A User's Guide. Routledge.</li> </ul> |

**SIOB280 - Traditional and Agile Project Management**

|                                                   |                                          |
|---------------------------------------------------|------------------------------------------|
| <b>Module number</b>                              | SIOB280                                  |
| <b>Module designation according to SPO or SPP</b> | Traditional and Agile Project Management |
| <b>Language</b>                                   | English                                  |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule   |
| <b>Person responsible for the module</b>          | Prof. Dr. Martin Prasch                  |

|                      |                      |
|----------------------|----------------------|
| <b>Study section</b> | Second study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 3                           | 1               | -                 | -                   |

|                                                       |                                                                                                                                           |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                                                                                         |
| <b>Recommended prerequisites</b>                      | -                                                                                                                                         |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: exam, elaboration |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                          |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                  |
| <b>Proportion of the overall audit result</b>         | 20/486                                                                                                                                    |

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|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module aims/learning outcomes/learning outcomes aimed at</b> | <p>Students understand the principles of projects and project management. They are able to effectively work in projects and to manage and lead simple or small projects on their own.</p> <p><u>Students learn:</u></p> <ul style="list-style-type: none"> <li>- relevant terms and methods related to project management</li> <li>- characteristics of projects</li> <li>- basic leadership and management principles for project managers</li> <li>- how to use project management software</li> </ul> <p><u>They can:</u></p> <ul style="list-style-type: none"> <li>- define project scope and targets</li> <li>- select right project management approach and method (traditional, agile, hybrid)</li> <li>- plan project schedules, resources and cost</li> <li>- conduct and monitor stakeholder and risk management</li> <li>- conduct project controlling</li> </ul> <p>Besides, students learn how to organize tasks by applying efficient time management and result-oriented way of working.</p> <p>Students will be enabled to successfully apply for the optional "Basiszertifikat Projektmanagement GPM" of the Deutsche Gesellschaft für Projektmanagement (GPM), which is the German chapter of the International Project Management Association (IPMA).</p> |
| <b>Contents</b>                                                 | <p>In order to achieve the qualification targets, the following content is covered:</p> <ul style="list-style-type: none"> <li>- introduction to project management</li> <li>- project definition and target specification</li> <li>- project organization</li> <li>- Stakeholder and risk management</li> <li>- planning of project phases, schedules, milestones, resources and cost</li> <li>- introduction to project controlling and earned value analysis</li> <li>- different agile project management methods</li> <li>- hybrid project management</li> <li>- introduction to leadership</li> <li>- project management software</li> </ul> <p>The content is closely related to the Individual Competence Baseline 4.0 of the International Project Management Association (IPMA).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Media</b>                                                    | Tablet PC/projector, blackboard, flip chart, classroom response systems, moodle, virtual classrooms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

|                   |                                                                                                                                  |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Literature</b> | The latest issue of:<br>Kerzner, Harold: Project management: a systems approach to planning, scheduling, and controlling. Wiley. |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------|

**SIOBF40 - German IV**

See section 4.

**3. Module descriptions for the 5th, 6th and 7th semester****3.1 Compulsory modules in the practical study semester****SIOB290 - Internship**

|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                  |          |            |              |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|----------|------------|--------------|
| Module number                                  | SIOB290                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                  |          |            |              |
| Module designation according to SPO and SPP    | Internship                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                  |          |            |              |
| Language                                       | German or the working language of the internship company                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                  |          |            |              |
| Lecturer                                       | See semester-specific lecture schedule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                  |          |            |              |
| Person responsible for the module              | Prof. Dr. Robert Baumhof                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                  |          |            |              |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                  |          |            |              |
| Study section                                  | Third study section (Practical semester)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                  |          |            |              |
| Module type                                    | Mandatory module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                  |          |            |              |
| Module group                                   | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                  |          |            |              |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                  |          |            |              |
| ECTS points                                    | 24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                  |          |            |              |
| Workload (working days)                        | Total                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Course                                           |          | Self-study |              |
|                                                | 80 working days                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -                                                |          | -          |              |
| Forms of teaching (semester hours per week)    | Total                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Seminaristic Lessons                             | Exercise | Internship | Project-work |
|                                                | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | See semester-specific study and examination plan |          |            |              |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                  |          |            |              |
| Module-specific prerequisites according to SPO | All exams of the first and second semester must be passed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                  |          |            |              |
| Recommended prerequisites                      | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                  |          |            |              |
| Exam                                           | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                  |          |            |              |
| Admission requirement for the examination      | See semester-specific study and examination plan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                  |          |            |              |
| Evaluation of the examination performance      | not end-graded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                  |          |            |              |
| Proportion of the overall audit result         | 0/486                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                  |          |            |              |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                  |          |            |              |
| Module Objectives/Objectives Learning Outcomes | <p>Introduction to the activity and working methodology of the engineer based on concrete tasks and projects in the field of sustainability.</p> <ul style="list-style-type: none"><li>– Extension and deepening of the knowledge, skills and competences acquired in the first semesters</li><li>– Develop an understanding of the subject-specific professional environment</li></ul> <p>Special emphasis shall be placed on the use and development of the following <u>competences</u>:</p> <ul style="list-style-type: none"><li>– Ability to communicate and cooperate effectively in a horizontal and vertical direction as well as the ability to grasp, present and assess processes and problems independently</li><li>– Ability to define, organize and carry out tasks/projects in a team and to evaluate and present the results</li></ul> |                                                  |          |            |              |
| Contents                                       | <p>The internship is to be completed in a manufacturing or service company. The company-dependent tasks are to be selected from engineering practice and - in order to ensure an appropriate technical depth - may originate from a maximum of three of the following areas:</p> <ul style="list-style-type: none"><li>– Research or development project</li><li>– Participation in IT projects in as many project phases as possible</li><li>– Operational processes in production, quality assurance and quality management as well as project work or project management</li><li>– Product management, marketing and sales, service and maintenance</li><li>– Customer service, procurement and materials management and logistics</li><li>– Accounting, Controlling and Human Resources</li></ul>                                                   |                                                  |          |            |              |
| Media                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                  |          |            |              |
| Literature                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                  |          |            |              |

**SIOB300 - Internship Seminar to SIOB290**

|                                                   |                                                                                    |
|---------------------------------------------------|------------------------------------------------------------------------------------|
| <b>Module number</b>                              | SIOB300                                                                            |
| <b>Module designation according to SPO or SPP</b> | Internship Seminar (can only be completed after the practical time in the company) |
| <b>Language</b>                                   | English                                                                            |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule                                             |
| <b>Person responsible for the module</b>          | Prof. Dr. Robert Baumhof                                                           |

|                      |                                                                                      |
|----------------------|--------------------------------------------------------------------------------------|
| <b>Study section</b> | Third study section (The practical seminar is usually held in the semester holidays) |
| <b>Module type</b>   | Mandatory module                                                                     |
| <b>Module group</b>  | -                                                                                    |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 2            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 60           | 30                          |                 | 30                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 2            | 2                           | -               | -                 | -                   |

|                                                       |                                                                                    |
|-------------------------------------------------------|------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | All examinations of the first and second semester must be passed.                  |
| <b>Recommended prerequisites</b>                      | -                                                                                  |
| <b>Exam</b>                                           | -                                                                                  |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                   |
| <b>Evaluation of the examination performance</b>      | Not final grade, i.e. predicate "passed with success" or "passed without success". |
| <b>Proportion of the overall audit result</b>         | 0/486                                                                              |

|                                                       |                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <p>Knowledge:<br/>Understanding of the subject-specific professional environment</p> <p>Skills:<br/>Ability to present operational structures, operational processes and own work results</p> <p>Competences:<br/>Ability to expand, deepen and network theoretically acquired and practically experienced knowledge</p> |
| <b>Contents</b>                                       | <ul style="list-style-type: none"> <li>– Presentations and reports (in English) by the students about their activities in the companies during the practical study semester.</li> <li>– Linking practical training with the curriculum of the university</li> </ul>                                                      |
| <b>Media</b>                                          | Tablet PC with beamer, document camera, blackboard or whiteboard                                                                                                                                                                                                                                                         |

### 3.2 Compulsory modules in the practical and the two theoretical semesters of the 5th, 6th and 7th semester

#### SIOB310 - Seminar Research Studies

|                                                   |                                        |
|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB310                                |
| <b>Module designation according to SPO or SPP</b> | Seminar Research Studies               |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Prof. Dr. Michael Bethke               |

|                      |                      |
|----------------------|----------------------|
| <b>Study section</b> | Fourth study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 3            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 90           | 30                          |                 | 60                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 2            | 2                           | -               | -                 | -                   |

|                                                       |                                                                                                                                                   |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | All examinations of the first and second semester must be passed                                                                                  |
| <b>Recommended prerequisites</b>                      | -                                                                                                                                                 |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the examination regulations there are following options: elaboration, presentation |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                  |
| <b>Evaluation of the examination performance</b>      | endnotes                                                                                                                                          |
| <b>Proportion of the overall audit result</b>         | 2/499                                                                                                                                             |

|                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module aims/learning outcomes/learning outcomes aimed at</b> | <p>Knowledge:</p> <p>Know the process and methodology of science</p> <p>Skills:</p> <ul style="list-style-type: none"> <li>– Conduct thorough literature research and use appropriate sources of professional information for job purposes</li> <li>– Speak and write in a scientifically correct way</li> </ul> <p>Competences:</p> <ul style="list-style-type: none"> <li>– Prepare and present results of academic articles, and document these results</li> <li>– Critically analyze subject-specific statements, discuss them and assess them regarding their practical relevance</li> </ul> |
| <b>Contents</b>                                                 | Recognizing the criteria of a successful academic paper regarding content, structure, literature research, and citation. Introduction to the methodology of science by in-depth discussion of a selected topic of engineering and management                                                                                                                                                                                                                                                                                                                                                      |
| <b>Media</b>                                                    | Tablet PC/projector, blackboard or whiteboard, flip chart, videos                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Literature</b>                                               | According to topic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

**SIOB320 - Smart Manufacturing and Industry 4.0**

|                                                   |                                        |
|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB320                                |
| <b>Module designation according to SPO or SPP</b> | Smart Manufacturing and Industry 4.0   |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Prof. Dr. Michael Bethke               |

|                      |                      |
|----------------------|----------------------|
| <b>Study section</b> | Fourth study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 4                           | -               | -                 | -                   |

|                                                       |                                                                                                                                                         |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | Successful completion of the internship and 90 ECTS                                                                                                     |
| <b>Recommended prerequisites</b>                      | Principles of Electrical Engineering, Fundamentals of Computer Science, Software Development and Coding                                                 |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                        |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                |
| <b>Proportion of the overall audit result</b>         | 20/486                                                                                                                                                  |

|                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module aims/learning outcomes/learning outcomes aimed at</b> | <p>Knowledge:</p> <ul style="list-style-type: none"> <li>- Know the underlying technologies for industry 4.0</li> <li>- Understand the principles of the technologies and their importance to industry 4.0 (Cloud Computing, Internet of Things, AI &amp; Machine Learning, Edge Computing, Digital Twins)</li> <li>- Know the influence of industry 4.0 to lot size one production</li> <li>- Understand the difference between the IoT and the IIoT</li> <li>- Platform Ecosystems in the IIoT</li> <li>- Know the consequences and risks of Industry 4.0</li> </ul> <p>Skills:</p> <ul style="list-style-type: none"> <li>- Analysis of existing production systems and potential improvements in terms of automation and digitalization</li> <li>- Description of the technologies for industry 4.0</li> <li>- Description of business models and/or platform ecosystems of smart manufacturing enterprises</li> </ul> <p>Competences:</p> <ul style="list-style-type: none"> <li>- Be able to assess existing solutions</li> <li>- Be able to optimize existing (digital) production systems in the context of lot size one</li> <li>- Conduct basic modelling/description of platform ecosystems of Industry 4.0</li> </ul> |
| <b>Contents</b>                                                 | <ul style="list-style-type: none"> <li>- Importance of automation and automation objects</li> <li>- Basic rules for shopfloor optimization</li> <li>- The role of big data in manufacturing, IIoT</li> <li>- Design of automation systems and requirements for them</li> <li>- Components and systems of a smart factory</li> <li>- Data driven decision making</li> <li>- Technologies and interfaces of Industry 4.0 and their standards</li> <li>- Introduction digital twins and robotics</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Media</b>                                                    | Tablet PC/projector, blackboard or whiteboard, flip chart, videos                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Literature</b>                                               | <p>The latest issue of:</p> <ul style="list-style-type: none"> <li>- Cioffi, R. and De Felice, F.: Digital Transformation in Smart Manufacturing. IntechOpen.</li> <li>- Nayyar, A. and Kumar, A.: A Roadmap to Industry 4.0: Smart Production, Sharp Business and Sustainable Development. Springer.</li> <li>- Bee L.: PLC and HMI Development with Siemens TIA Portal</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

**SIOB330 - Data science and AI**

|                                                   |                                        |
|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB330                                |
| <b>Module designation according to SPO or SPP</b> | Data Science and AI                    |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Prof. Dr. Christof Westerhoven         |

|                      |                      |
|----------------------|----------------------|
| <b>Study section</b> | Fourth study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 4                           | -               | -                 | -                   |

|                                                       |                                                                                                                                                         |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | Successful completion of the internship and 90 ECTS                                                                                                     |
| <b>Recommended prerequisites</b>                      | Fundamentals of Computer Science                                                                                                                        |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                        |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                |
| <b>Proportion of the overall audit result</b>         | 20/486                                                                                                                                                  |

|                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module aims/learning outcomes/learning outcomes aimed at</b> | <p>Knowledge:</p> <ul style="list-style-type: none"> <li>– The students are familiar with the activities of a data scientist and can explain them. They also know the individual process steps of data integration</li> <li>– Statistical methods to extract information from the data and also have basic knowledge of machine learning</li> <li>– The students are familiar with sub-areas of artificial intelligence and are able to explain them.</li> <li>– They know typical applications of artificial intelligence in industry.</li> </ul> <p>Skills:</p> <ul style="list-style-type: none"> <li>– Ability to analyse amounts of data with statistical methods.</li> <li>– Ability to formalize concrete problems in the context of AI.</li> </ul> <p>Competences:</p> <ul style="list-style-type: none"> <li>– As a platform for the documentation of the individual knowledge representations of the data Jupyter Notebooks is used</li> <li>– Deciding for which problems these methods are suitable and ability to explain some of the basic algorithms.</li> </ul> |
| <b>Contents</b>                                                 | <ul style="list-style-type: none"> <li>– Introduction: What is Data Science?</li> <li>– Characteristics of Data: Big Data vs. Data; structured / unstructured data; categorical / quantitative data</li> <li>– Descriptive statistics, causality and correlation. Exploratory data analysis</li> <li>– Machine learning (linear regression, k-nearest neighbours, k-means)</li> <li>– Model evaluation (performance metrics) Insights into the professional field of Data Science / Data Science in companies.</li> <li>– Definition and overview of artificial intelligence.AI History</li> <li>– Intelligent Agents</li> <li>– Problem solving by search</li> <li>– Logical agents</li> <li>– Short Introduction to machine learning and neural networks</li> <li>– AI in industry</li> </ul>                                                                                                                                                                                                                                                                                 |
| <b>Media</b>                                                    | Tablet PC/projector, blackboard or whiteboard, flip chart, videos                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Literature</b>                                               | <p>The latest issue of:</p> <ul style="list-style-type: none"> <li>– Skiena, Steven S.: The Data Science Design Manual; Springer</li> <li>– O'Neil, Cathy; Schutt, Rachel: Doing Data Science; O'Reilly</li> <li>– Trevor Hastie, Tibshirani, Robert; Friedman, Jerome: The Elements of Statistical Learning: Data Mining, Inference and Prediction; Springer</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"><li>– Igual, Laura; Santi Segui: Introduction to Data Science; Springer</li><li>– So, Anthony; Joseph, Thomas V.; Robert Thas John; Worsley, Andrew, Samuel Asare: The Data Science Workshop; Pack Publishing</li><li>– Russel, S.; Norvig, P.: Artificial Intelligence: A Modern Approach; Pearson;</li><li>– Poole, D.L.; Mackworth, A.K.: Artificial Intelligence: Foundations of Computational Agents; Cambridge University Press</li><li>– Ertel, W.: Introduction to Artificial Intelligence; Springer</li><li>– Goodfellow, Y. Bengio, Courville, A.: Deep Learning; MIT Press</li><li>– Segaran, Toby: Programming Collective Intelligence</li></ul> |
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**SIOB340 - Supply Chain Management**

|                                                   |                                        |
|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB340                                |
| <b>Module designation according to SPO or SPP</b> | Supply Chain Management                |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Prof. Dr. Robert Baumhof               |

|                      |                      |
|----------------------|----------------------|
| <b>Study section</b> | Fourth study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 4                           | -               | -                 | -                   |

|                                                       |                                                                                                                                                         |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | Successfully completion of the internship and 90 ECTS                                                                                                   |
| <b>Recommended prerequisites</b>                      | Procurement, Manufacturing and Logistics (SIOB210)                                                                                                      |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                        |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                |
| <b>Proportion of the overall audit result</b>         | 20/486                                                                                                                                                  |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <p><u>Knowledge:</u><br/>The students have acquired foundational knowledge of supply chain strategy, planning, and operations. They are able to classify, evaluate, and analyze supply chain decisions at the strategic, planning, and operational levels independently or in teamwork.</p> <p><u>Skills:</u><br/>Students master the key frameworks, quantitative methods, and terminology of supply chain management. They can apply analytical tools for demand forecasting, inventory management, network design, and transportation planning.</p> <p><u>Competences:</u><br/>Students have gained the ability to align supply chain strategy with competitive strategy, to evaluate trade-offs between responsiveness and efficiency across supply chain drivers, and to understand how sourcing, pricing, and sustainability decisions affect supply chain performance.</p>                                                                |
| <b>Contents</b>                                       | <ul style="list-style-type: none"> <li>- Understanding the supply chain: stages, decision phases, process views</li> <li>- Supply chain performance: strategic fit, responsiveness vs. efficiency</li> <li>- Supply chain drivers and metrics: facilities, inventory, transportation, information, sourcing, pricing</li> <li>- Distribution network design and facility location decisions</li> <li>- Demand forecasting: methods, accuracy, and role in planning</li> <li>- Aggregate planning: balancing supply and demand</li> <li>- Inventory management: cycle inventory (EOQ), safety inventory, optimal product availability</li> <li>- Transportation: modes, design options, trade-offs, routing</li> <li>- Sourcing decisions: in-house vs. outsource, supplier selection, contracts</li> <li>- Pricing and revenue management</li> <li>- Sustainability in supply chains: closed-loop supply chains, sustainable sourcing</li> </ul> |
| <b>Media</b>                                          | Projector, blackboard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Literature</b>                                     | <p>The respective current edition of:</p> <ul style="list-style-type: none"> <li>- Chopra, Sunil: <i>Supply Chain Management: Strategy, Planning, and Operation</i>. 8th ed., Pearson.</li> <li>- Lyons, Kenneth; Farrington, Brian: <i>Procurement and Supply Chain Management</i>. Pearson Education.</li> <li>- Christopher, Martin: <i>Logistics &amp; Supply Chain Management</i>. Pearson.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

**SIOB350 - Enterprise Resource Planning**

|                                                   |                                        |
|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB350                                |
| <b>Module designation according to SPO or SPP</b> | Enterprise Resource Planning           |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Prof. Dr. Christof Westerhoven         |

|                      |                      |
|----------------------|----------------------|
| <b>Study section</b> | Fourth study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 2                           | -               | 2                 | -                   |

|                                                       |                                                                                                                                                         |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | Successful completion of the internship and 90 ECTS                                                                                                     |
| <b>Recommended prerequisites</b>                      | Basic knowledge in business administration (SIOB130) and accounting (SIOB230)                                                                           |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                        |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                |
| <b>Proportion of the overall audit result</b>         | 20/486                                                                                                                                                  |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <p>Knowledge:<br/>Students know the basic concepts of ERP systems.</p> <p>Skills:<br/>Students can handle a concrete ERP system in an overview-like manner.</p> <p>Competences:</p> <ul style="list-style-type: none"> <li>– Ability to deal with basic terms from the field of ERP systems</li> <li>– Understanding of the interrelationship of functionalities in an ERP system</li> <li>– Ability to apply business management concepts in a concrete ERP system.</li> </ul>                                                                                                                                                      |
| <b>Contents</b>                                       | <ul style="list-style-type: none"> <li>– Processes in the areas of purchasing, materials and inventory management, business partners, sales as well as human resources and accounting with an ERP system</li> <li>– The lecture provides a process-oriented insight into the functionality, architectural principles and technologies of ERP systems.</li> <li>– Basics of ERP systems (integration types, master data, transaction data)</li> <li>– Use of ERP systems in the areas of logistics, accounting and human resources</li> <li>– The core element of the lecture is the practical exercises on an ERP system.</li> </ul> |
| <b>Media</b>                                          | Blackboard, overhead projector, beamer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Literature</b>                                     | <p>The respective current edition of:</p> <ul style="list-style-type: none"> <li>– Guerrero, S.: Custom Fiori Applications in SAP Hana. Springer</li> <li>– Kees, A.: Open Source Enterprise Software. Springer</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                           |

**SIOB360 - Sustainable development III: Transformations, Scenarios**

|                                                   |                                                         |
|---------------------------------------------------|---------------------------------------------------------|
| <b>Module number</b>                              | SIOB360                                                 |
| <b>Module designation according to SPO or SPP</b> | Sustainable development III: Transformations, Scenarios |
| <b>Language</b>                                   | English                                                 |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule                  |
| <b>Person responsible for the module</b>          | Prof. Dr. Robert Baumhof                                |

|                      |                      |
|----------------------|----------------------|
| <b>Study section</b> | Fourth study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 4                           | -               | -                 | -                   |

|                                                       |                                                                                                                                                         |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | Successful completion of the internship and 90 ECTS                                                                                                     |
| <b>Recommended prerequisites</b>                      | Successful completion of the modules Sustainable Development I and II                                                                                   |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                        |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                |
| <b>Proportion of the overall audit result</b>         | 20/486                                                                                                                                                  |

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|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <p><u>Knowledge:</u></p> <ul style="list-style-type: none"> <li>– Categories and elements of future scenarios</li> <li>– Fundamentals of transformation research</li> <li>– Principles for the management of sustainability-oriented transformations as well as future designs for selected transformation fields</li> </ul> <p><u>Skills:</u></p> <ul style="list-style-type: none"> <li>– Formation of scenarios and critical analysis of future designs</li> <li>– Application of methods for the evaluation of transformation</li> </ul> <p><u>Competences:</u></p> <ul style="list-style-type: none"> <li>– Recognize and describe inter- and transdisciplinary tasks and solutions</li> <li>– Multi-perspective assessment of transformative future scenarios</li> <li>– Derivation and operationalization of transformation tasks</li> </ul> |
| <b>Contents</b>                                       | <ul style="list-style-type: none"> <li>– Transformation fields: Overview</li> <li>– Scenario building: Approaches / Techniques / Examples</li> <li>– Transformation theory and models: transformation research / multi-level perspective / process models / narratives / tipping points</li> <li>– Great transformations: <ul style="list-style-type: none"> <li>o Energy transition, mobility transition, prosperity and consumption transition, industrial transition and critical analysis of published concepts</li> <li>o Methods of alternative assessment and selection</li> <li>o Transformation tasks for industrial engineers at company and inter-company level</li> </ul> </li> <li>– Principles for the management of sustainability-oriented transformations</li> </ul>                                                               |
| <b>Media</b>                                          | Tablet PC with beamer, overhead projector, black and white board                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Literature</b>                                     | <p>The respective current edition of:</p> <ul style="list-style-type: none"> <li>– WBGU: World in Transition – A Social Contract for Sustainability.</li> <li>– Göpel, Maja: The Great Mindshift: How a New Economic Paradigm and Sustainability Transformations Go Hand in Hand — Springer International Publishing / Springer, Berlin.</li> <li>– Grunwald, Armin: Technology Assessment in Practice and Theory — Routledge.</li> <li>– Schwartz, Peter: The Art of the Long View: Planning for the Future in an Uncertain World — Wiley.</li> <li>– van der Heijden, Kees: Scenarios: The Art of Strategic Conversation — Wiley.</li> </ul>                                                                                                                                                                                                      |

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|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"><li>– Geels, Frank W.: Technological Transitions and System Innovations — Edward Elgar.</li><li>– Loorbach, Derk: Transition Management: New Mode of Governance for Sustainable Development — International Books.</li><li>– Köhler, Jonathan et al.: An Agenda for Sustainability Transitions Research: State of the Art and Future Directions — in Environmental Innovation and Societal Transitions.</li><li>– IPCC: Climate Change 2022: Mitigation of Climate Change — Working Group III of AR6.</li></ul> |
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**SIOB370 - International Business and Cross-Cultural Communication**

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|---------------------------------------------------|---------------------------------------------------------|
| <b>Module number</b>                              | SIOB370                                                 |
| <b>Module designation according to SPO or SPP</b> | International Business and Cross-Cultural Communication |
| <b>Language</b>                                   | English                                                 |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule                  |
| <b>Person responsible for the module</b>          | Prof. Dr. Martin Prasch                                 |

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|----------------------|----------------------|
| <b>Study section</b> | Fourth study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

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|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 4                           | -               | -                 | -                   |

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|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | Successful completion of the internship and 90 ECTS                                                                                               |
| <b>Recommended prerequisites</b>                      | -                                                                                                                                                 |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: presentation, elaboration |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                  |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                          |
| <b>Proportion of the overall audit result</b>         | 20/486                                                                                                                                            |

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| <b>Module aims/learning outcomes/learning outcomes aimed at</b> | <p>Knowledge:</p> <ul style="list-style-type: none"> <li>- Know the characteristics, advantages, and problems of economic internationalization</li> <li>- Understand the importance of international business and competition</li> <li>- Distinct International Business Activities</li> <li>- Detailed knowledge of the key questions and planning steps for business internationalization</li> <li>- Know the typical operational issues caused by internationalization</li> <li>- Understand the concept of culture and its importance for business</li> <li>- Know the basic terms and theories of cross-cultural communication, such as diversity, stereotypes, cultural identity and perception.</li> </ul> <p>Skills:</p> <ul style="list-style-type: none"> <li>- Identify business opportunities and issues due to internationalization</li> <li>- Apply some selected methods for solving internationalization issues in business</li> <li>- Develop internationalization strategies</li> <li>- Describe cultures</li> </ul> <p>Competences:</p> <ul style="list-style-type: none"> <li>- Assess the complexity of challenges in international businesses</li> <li>- Assess one's own culture and its influence on behavior</li> <li>- Communicate effectively in international teams</li> </ul> |
| <b>Contents</b>                                                 | <ul style="list-style-type: none"> <li>- Definition and reasons for international (cross country) business activities</li> <li>- Worlds' regions and general specifics of market places</li> <li>- Risks in International Business (4 dimensions: 1. country specific, 2. currency, 3. cultural, 4. commercial)</li> <li>- International Strategic Management Process</li> <li>- 6 Step Global Market Opportunity Assessment</li> <li>- Detailed Foreign Market Entry Planning according 5 distinct Int. Business Activities</li> <li>- International Marketing &amp; Sales</li> <li>- Global Operations &amp; Global Sourcing</li> <li>- Intercultural Management</li> <li>- Business Ethics &amp; CSR in International Business</li> <li>- Trade Theories</li> <li>- Cultural impacts on international business and communication</li> <li>- Means of effective communication in the presence of cultural diversity</li> </ul>                                                                                                                                                                                                                                                                                                                                                                           |

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|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Media</b>      | Tablet PC/projector, blackboard or whiteboard, flip chart, videos                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Literature</b> | <p>The latest issue of:</p> <ul style="list-style-type: none"><li>– Griffin, Ricky et. al.: International Business – A Managerial Perspective. Pearson Education limited.</li><li>– Cavusgil, Tamer et. al.: A Framework for International Business. Pearson Education limited.</li><li>– Hofstede, Geert et. al.: Cultures and Organizations: Software of the Mind, Third Edition: Intercultural Cooperation and Its Importance for Survival. McGraw Hill.</li></ul> |

**SIOB380 - Mobility Innovations**

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|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB380                                |
| <b>Module designation according to SPO or SPP</b> | Mobility Innovations                   |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Prof. Dr. Michael Bethke               |

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| <b>Study section</b> | Fourth study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

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|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 4                           | -               | -                 |                     |

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|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | Successful completion of the internship and 90 ECTS                                                                                                     |
| <b>Recommended prerequisites</b>                      | -                                                                                                                                                       |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                        |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                |
| <b>Proportion of the overall audit result</b>         | 20/486                                                                                                                                                  |

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|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <p>Knowledge:</p> <ul style="list-style-type: none"> <li>– Know the phases of the diffusion innovation lifecycle</li> <li>– Know common use cases for (autonomous-vehicle) AV's and their underlying importance in future urban mobility</li> <li>– Understand the importance of users trust and criteria of acceptance</li> <li>– Know the contradiction and ethics of legal regulations</li> <li>– Understand the problem of mixed traffic</li> <li>– Know the CASE Logic</li> <li>– Understand the Business Model Management of shared mobility and shared-AV-providers</li> </ul> <p>Skills:</p> <ul style="list-style-type: none"> <li>– Describing and classifying mobility concepts and extending these</li> <li>– Application of selected methods to create business models for mobility providers.</li> <li>– Application of legal restrictions to the areas of road safety/mixed traffic</li> </ul> <p>Competences:</p> <ul style="list-style-type: none"> <li>– Assessing the complexity of the Future of Mobility</li> <li>– Be able to evaluate and complete existing solutions</li> </ul> |
| <b>Contents</b>                                       | <ul style="list-style-type: none"> <li>– Phases of the diffusion innovation lifecycle</li> <li>– Technologies for the future of mobility: AVs</li> <li>– Mixed Traffic Problem</li> <li>– Four Element Model</li> <li>– CASE Logic</li> <li>– Users Trust</li> <li>– Legal regulations for AVs and Road Safety</li> <li>– Public Transport / Individual Transport / Goods Traffic</li> <li>– Micromobility solutions and last-mile-vehicles</li> <li>– Business Model Management (Mobility of the Future: Mobility as a Service, Fleet Service Management, Car Sharing)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Media</b>                                          | Blackboard, overhead projector, beamer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Literature</b>                                     | <p>The latest edition of:</p> <ul style="list-style-type: none"> <li>– Economic Commission for Europe: A Handbook on Sustainable Urban Mobility and Spatial Planning</li> <li>– Proceedings of the International Conference on Vehicle Technology and Intelligent Transport Systems (VEHITS) and Proceedings of the International Conference on Smart Cities and Green ICT Systems (SMARTGREENS)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

**SIOB390 - Energy infrastructure**

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|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB390                                |
| <b>Module designation according to SPO or SPP</b> | Energy infrastructure                  |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Prof. Dr. Robert Baumhof               |

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|----------------------|----------------------|
| <b>Study section</b> | Fourth study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

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|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 5            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 150          | 60                          |                 | 90                |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 4            | 4                           | -               | -                 | -                   |

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|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | Successful completion of the internship and 90 ECTS                                                                                                     |
| <b>Recommended prerequisites</b>                      | -                                                                                                                                                       |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: exam, oral exam, practical exam |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                        |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                                |
| <b>Proportion of the overall audit result</b>         | 20/486                                                                                                                                                  |

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| <b>Qualification goals</b> | <p>Students are able to:</p> <p><u>Knowledge:</u></p> <ul style="list-style-type: none"> <li>- explain the functions, structures and technical characteristics of major energy infrastructures;</li> <li>- describe how electricity, gas, hydrogen, heat and compressed air are transported, distributed and supplied;</li> <li>- distinguish between transmission, distribution and industrial on-site networks;</li> <li>- explain the role of energy infrastructure in industrial production, security of supply and the energy transition;</li> <li>- describe relevant technical components, operating principles, market structures and regulatory frameworks.</li> </ul> <p><u>Skills:</u></p> <ul style="list-style-type: none"> <li>- analyze energy-infrastructure systems and their technical and economic boundary conditions;</li> <li>- compare infrastructure options with regard to efficiency, capacity, reliability, flexibility, cost and environmental impact;</li> <li>- perform basic calculations relating to energy transport, pressure, flow, capacity, losses and storage;</li> <li>- identify infrastructure requirements for industrial consumers and assess suitable supply concepts;</li> <li>- evaluate challenges arising from renewable-energy integration, electrification, hydrogen and sector coupling.</li> </ul> <p><u>Competences:</u></p> <ul style="list-style-type: none"> <li>- assess energy-infrastructure concepts from technical, economic and sustainability perspectives;</li> <li>- identify interactions between public networks, industrial infrastructure and energy markets;</li> <li>- develop and justify basic infrastructure solutions for industrial and societal applications;</li> <li>- recognize trade-offs between efficiency, resilience, affordability, security of supply and decarbonization.</li> </ul> |
| <b>Contents</b>            | <ul style="list-style-type: none"> <li>- Fundamentals and structures of energy infrastructure</li> <li>- Electricity transmission and distribution, including HVAC, HVDC, substations and industrial grids</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

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|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   | <ul style="list-style-type: none"> <li>- Gas and hydrogen infrastructure: pipelines, compression, pressure regulation, storage and distribution</li> <li>- District heating, cooling and industrial process-heat networks</li> <li>- Compressed-air generation, treatment, storage and distribution</li> <li>- Energy storage, sector coupling and integration of renewable energy</li> <li>- Efficiency, losses, reliability, resilience and security of supply</li> <li>- Digital monitoring, control and technical-economic assessment</li> <li>- Application examples from industrial and public energy systems</li> </ul>                                                                                                                                                                                                                                              |
| <b>Media</b>      | Tablet PC/beamer, blackboard, overhead projector                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Literature</b> | <p>The respective current edition of:</p> <ul style="list-style-type: none"> <li>- Weedy, B. M.; Cory, B. J.; Jenkins, N.; Ekanayake, J. B.; Strbac, G.: Electric Power Systems. Wiley.</li> <li>- Padiyar, K. R.: HVDC Power Transmission Systems: Technology and System Interactions. New Age International.</li> <li>- Mokhatab, S.; Poe, W. A.; Mak, J. Y.: Handbook of Natural Gas Transmission and Processing. Elsevier.</li> <li>- Gupta, R. B. (ed.): Hydrogen Fuel: Production, Transport, and Storage. CRC Press.</li> <li>- Wiltshire, R. (ed.): Advanced District Heating and Cooling (DHC) Systems. Woodhead Publishing / Elsevier.</li> <li>- Barber, A.: Pneumatic Handbook. Elsevier.</li> <li>- Capehart, B. L.; Turner, W. C.; Kennedy, W. J.: Guide to Energy Management. CRC/Taylor &amp; Francis or River Publishers, depending on edition.</li> </ul> |

**SIOB400 - Seminar on Sustainable Development**

|                                                   |                                        |
|---------------------------------------------------|----------------------------------------|
| <b>Module number</b>                              | SIOB400                                |
| <b>Module designation according to SPO or SPP</b> | Seminar on Sustainable Development     |
| <b>Language</b>                                   | English                                |
| <b>Lecturer</b>                                   | See semester-specific lecture schedule |
| <b>Person responsible for the module</b>          | Prof. Dr. Robert Baumhof               |

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|----------------------|----------------------|
| <b>Study section</b> | Fourth study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

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|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 4            |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 120          | 60                          |                 | 600               |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | 2            | 2                           | -               | -                 | -                   |

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|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | Successful completion of the internship and 90 ECTS                                                                                               |
| <b>Recommended prerequisites</b>                      | Successful completion of the modules Sustainable Development I-III                                                                                |
| <b>Exam</b>                                           | See semester-specific study and examination plan, according to the Examination regulations there are following options: presentation, elaboration |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan                                                                                                  |
| <b>Evaluation of the examination performance</b>      | Endnotes                                                                                                                                          |
| <b>Proportion of the overall audit result</b>         | 16/486                                                                                                                                            |

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|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <p><u>Knowledge:</u><br/>Students have knowledge of:</p> <ul style="list-style-type: none"> <li>– scientific research, academic writing and project-based problem solving;</li> <li>– methods for analyzing industrial and societal sustainability challenges;</li> <li>– environmental, technical, economic and social assessment approaches;</li> <li>– strategy, scenario and implementation planning;</li> <li>– stakeholder involvement and sustainability-oriented decision-making.</li> </ul> <p><u>Skills:</u><br/>Students are able to:</p> <ul style="list-style-type: none"> <li>– formulate research questions and conduct structured literature reviews;</li> <li>– select and apply suitable methods from previous SIOB modules;</li> <li>– analyze complex industrial or societal sustainability challenges;</li> <li>– compare technologies, strategies and scenarios;</li> <li>– assess impacts, stakeholders, uncertainties and trade-offs;</li> <li>– develop implementation plans and scientifically justified recommendations;</li> <li>– prepare and present a structured scientific report.</li> </ul> <p><u>Competences:</u><br/>Students are able to:</p> <ul style="list-style-type: none"> <li>– independently conduct an applied sustainability project;</li> <li>– integrate technical, economic, environmental and societal perspectives;</li> <li>– critically evaluate data, assumptions, methods and results;</li> <li>– develop practical solutions for companies, public institutions or communities;</li> <li>– communicate findings to specialist and non-specialist audiences.</li> </ul> |
| <b>Contents</b>                                       | <ul style="list-style-type: none"> <li>- Scientific research, academic writing, citation and presentation</li> <li>- Research questions, literature review, project design and methodology</li> <li>- Application of methods from previous SIOB modules, including: <ul style="list-style-type: none"> <li>• greenhouse-gas accounting and decarbonization;</li> <li>• life cycle assessment and product sustainability;</li> <li>• energy efficiency, renewable energy and energy infrastructure;</li> <li>• circular economy, material flows and waste management;</li> <li>• sustainable production, buildings and supply chains;</li> <li>• stakeholder management, CSR and sustainability reporting</li> </ul> </li> <li>- Analysis of selected industrial or societal sustainability challenges</li> <li>- Development and comparison of technologies, strategies and future scenarios</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   | <ul style="list-style-type: none"><li>- Environmental, technical, economic and social evaluation</li><li>- Stakeholder analysis, participation and conflict management</li><li>- Consideration of uncertainties, trade-offs and implementation barriers</li><li>- Development of roadmaps and recommendations</li><li>- Scientific report, presentation, discussion and peer feedback</li></ul> |
| <b>Media</b>      | Tablet PC with beamer, overhead projector, blackboard                                                                                                                                                                                                                                                                                                                                           |
| <b>Literature</b> | Literature will be announced in the course                                                                                                                                                                                                                                                                                                                                                      |

**SIOB410 - Bachelor's Thesis**

|                                                   |                         |
|---------------------------------------------------|-------------------------|
| <b>Module number</b>                              | SIOB410                 |
| <b>Module designation according to SPO or SPP</b> | Bachelor's Thesis       |
| <b>Language</b>                                   | English                 |
| <b>Lecturer</b>                                   | -                       |
| <b>Person responsible for the module</b>          | Prof. Dr. Martin Prasch |

|                      |                      |
|----------------------|----------------------|
| <b>Study section</b> | Fourth study section |
| <b>Module type</b>   | Mandatory module     |
| <b>Module group</b>  | -                    |

|                                                    |              |                             |                 |                   |                     |
|----------------------------------------------------|--------------|-----------------------------|-----------------|-------------------|---------------------|
| <b>ECTS points</b>                                 | 12           |                             |                 |                   |                     |
| <b>Workload (hours)</b>                            | <b>Total</b> | <b>Course</b>               |                 | <b>Self-study</b> |                     |
|                                                    | 360          | -                           |                 | 360               |                     |
| <b>Forms of teaching (semester hours per week)</b> | <b>Total</b> | <b>Seminaristic Lessons</b> | <b>Exercise</b> | <b>Internship</b> | <b>Project-work</b> |
|                                                    | -            | -                           | -               | -                 | -                   |

|                                                       |                                                     |
|-------------------------------------------------------|-----------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | Successful completion of the internship and 90 ECTS |
| <b>Recommended prerequisites</b>                      | -                                                   |
| <b>Exam</b>                                           | -                                                   |
| <b>Admission requirement for the examination</b>      | See semester-specific study and examination plan    |
| <b>Evaluation of the examination performance</b>      | Endnotes                                            |
| <b>Proportion of the overall audit result</b>         | 48/486                                              |

|                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module aims/learning outcomes/learning outcomes aimed at</b> | <p>Knowledge:</p> <ul style="list-style-type: none"> <li>- Detailed and up-to-date knowledge on a topic of engineering and management</li> </ul> <p>Skills:</p> <ul style="list-style-type: none"> <li>- Apply fundamental scientific methods</li> <li>- Conduct literature research</li> <li>- Use appropriate sources of professional information for job purposes</li> </ul> <p>Competences:</p> <ul style="list-style-type: none"> <li>- Apply the knowledge, skills and competences acquired in the course of the bachelor's degree program to professional engineering and management assignments</li> <li>- Complete projects within a limited time</li> </ul>                                                                         |
| <b>Contents</b>                                                 | <ul style="list-style-type: none"> <li>- In the bachelor's thesis topics from all fields of engineering and management with view to sustainability can be worked on. Their difficulty must be at bachelor's level.</li> <li>- The topic is determined by a lecturer or coordinated with an external enterprise/organisation.</li> <li>- Proposed topics and hints (in German) on how to write the thesis as well as additional documents (e.g. the registration form) can be found on <a href="https://www.haw-landshut.de/hochschule/fakultaeten/elektrotechnik-und-wirtschaftsingenieurwesen/downloads.html">https://www.haw-landshut.de/hochschule/fakultaeten/elektrotechnik-und-wirtschaftsingenieurwesen/downloads.html</a>.</li> </ul> |
| <b>Media</b>                                                    | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Literature</b>                                               | According to topic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## 4. Module descriptions for the foreign languages

### 4.1 Important notes on implementation

#### 4.1.1 General notes

The Bachelor's degree program "Sustainable Industrial Operations and Business" includes a compulsory foreign language:

Foreign students without German language skills must take the modules German I - IV.

Students who have acquired their study qualification at a German-speaking educational institution or whose native language is German or who demonstrate German language skills of at least reference level C1 or C2 of the CEFR for languages, choose a second foreign language (Foreign Language I – IV) in accordance with § 4, Paragraph 5, of the SPO Sustainable Industrial Operations and Business. Depending on the offer, any 2nd foreign language can be selected. At least 8 ECTS credits need to be gained from a 2<sup>nd</sup> foreign language other than English. For 8 more ECTS credits advanced courses in Business English or Engineering English at reference level B1 or higher can be chosen instead of continuing with the 2<sup>nd</sup> foreign language. In total, also the German-speaking students must gain 16 ECTS credits from language courses. German-speaking students may choose to start with advanced courses in Business or Engineering English instead of their foreign language.

The foreign language courses can be found in the Study and Examination Regulations of the Faculty of GKM. The Faculty of GKM is responsible for the content and descriptions of the study modules. The Study and Examination Regulations are published on the Faculty of GKM website, which you can access via the following link: [Hochschule – Organisation – rechtliche Angelegenheiten – Sprachen](#).

The language modules (German or foreign language) must be completed before the Internship in the 5<sup>th</sup> Semester. They are assigned to specific semesters in the study and examination regulations as well as in the study and examination plan. The participation requirements for individual modules can be found in the module descriptions of the Faculty of Interdisciplinary Studies. German-speaking students may choose to start with advanced courses in Business or Engineering English instead of their foreign language.

#### 4.1.2 German I-IV

In the four modules German I to IV according the study regulations, students acquire competences at the reference levels of at least A2 of the Common European Framework of Reference for Languages. The four modules comprise a total of 16 ECTS points and courses of 16 SWS. These are modules from the UNICert® Basis.

Students who already have German language skills at reference level A1 of the Common European Framework of Reference for Languages or higher, can prove these at the beginning of their studies in a placement test offered by Landshut University of Applied Sciences and can alternatively acquire the required amount of ECTS points in modules of higher reference levels such as A2 (UNICert® Basis), B1 or B2 (UNICert® I).

German-speaking students who already have foreign language skills at reference level A1 of the Common European Framework of Reference for Languages or higher, can prove these at the beginning of their studies in a placement test offered by Landshut University of Applied Sciences and can alternatively acquire the required amount of ECTS points in modules of higher reference levels such as A2 (UNICert® Basis), B1 or B2 (UNICert® I). German-speaking students can gain a maximum of 8 ECTS credits from advanced courses in Business or Engineering English instead of their foreign language. It is recommended for German-speaking students to choose either Spanish or Chinese, however, alternative choices depending on the offer are possible.

It is strongly recommended to complete all four modules of the respective languages (German and Foreign language) in the first four semesters. Depending on previous knowledge, the following combination of foreign language courses results:

UNICert® Basis

| Semester | Module number according to SPO | Module designation according to SPO            | Module name of the faculty " Interdisciplinary Studies |
|----------|--------------------------------|------------------------------------------------|--------------------------------------------------------|
| 1        | SIOBF10                        | German or 2 <sup>nd</sup> foreign language I   | UNICert® Basis 1a+1b                                   |
| 2        | SIOBF20                        | German or 2 <sup>nd</sup> foreign language II  | UNICert® Basis 1c+1d.                                  |
| 3        | SIOBF30                        | German or 2 <sup>nd</sup> foreign language III | UNICert® Basis 2a+2b                                   |
| 4        | SIOBF40                        | German or 2 <sup>nd</sup> foreign language IV  | UNICert® Basis 2c+2d                                   |

#### UNIcert® Basis and UNIcert® I

Before the placement test at the beginning of the first semester, each student must complete the form "Registration for Foreign Language" and hand it in to the person responsible for the program. The following information is required:

- Selected language (German or which Foreign Language)
- Previous knowledge of the chosen language; will be subject to a placement test

The choice made in the first semester can no longer be changed.

**5. Studium Generale****E100 - Studium Generale**

|                                          |                                       |
|------------------------------------------|---------------------------------------|
| <b>Module number</b>                     | E100                                  |
| <b>Module name</b>                       | Studium Generale                      |
| <b>Language</b>                          | German                                |
| <b>Lecturer</b>                          | see module Catalogue Studium Generale |
| <b>Person responsible for the module</b> | see module Catalogue Studium Generale |

|                      |                                            |
|----------------------|--------------------------------------------|
| <b>Study section</b> | The module can be studied in any semester. |
| <b>Module type</b>   | Mandatory module                           |
| <b>Module group</b>  | -                                          |

|                          |                          |               |                   |
|--------------------------|--------------------------|---------------|-------------------|
| <b>ECTS points</b>       | 6                        |               |                   |
| <b>Workload (hours)</b>  | <b>Total</b>             | <b>Course</b> | <b>Self-study</b> |
|                          | 180                      | 90            | 90                |
| <b>Forms of teaching</b> | Seminar teaching/project |               |                   |

|                                                       |                                                                               |
|-------------------------------------------------------|-------------------------------------------------------------------------------|
| <b>Module-specific prerequisites according to SPO</b> | -                                                                             |
| <b>Recommended prerequisites</b>                      | -                                                                             |
| <b>Exam</b>                                           | see module Catalogue Studium Generale                                         |
| <b>Admission requirement for the examination</b>      | see module Catalogue Studium Generale                                         |
| <b>Evaluation of the examination performance</b>      | Certificates of achievement "passed with success" or "passed without success" |
| <b>Proportion of the overall audit result</b>         | 0/499                                                                         |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives/Objectives Learning Outcomes</b> | <ul style="list-style-type: none"> <li>– Students know that understanding people and their life situations requires a holistic view of people.</li> <li>– Students know that aesthetics and culture have a fundamental influence on people and human behaviour.</li> <li>– Students recognise the importance of diversity in its various dimensions for society.</li> <li>– Students see their studies as an opportunity for comprehensive personal development beyond their professional training.</li> <li>– Students learn the importance of trans- and interdisciplinary scientific perspectives.</li> <li>– Students learn the importance of foreign language acquisition for their own personal development and broadening their professional horizons.</li> <li>– Students develop a reflected holistic concept of education.</li> <li>– They are aware of the social-ethical and scientific-ethical implications of subject-specific action.</li> <li>– They know their civil society responsibility and can responsibly use and reflect on their subject-specific knowledge.</li> </ul> |
| <b>Contents</b>                                       | The module represents the inter-faculty Studium Generale established at the university in the winter semester 2013/14, which is a component of every Bachelor's degree program at Landshut University. It includes inter-faculty courses that are intended to contribute to general scientific educational processes and personality development through their interdisciplinary orientation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Media</b>                                          | see module Catalogue Studium Generale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Literature</b>                                     | see module Catalogue Studium Generale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |