# Course description for
## "Operations Research" during the Winter Semester 2024/25

*Taught as part of module **"EM Business Analytics"***  <span style="color:red">**Current as of 05 Jun 2024**</span>

## Course Summary

A supply chain spans many partners. For example, BMW is working with 1,800 suppliers delivering from 4,000 locations to 30 plants. The aim of efficient supply chain management is to optimally align the processes and activities of the partners. The alignment of these processes and activities is complex as they are often subject to several constraints, such as time, money or other resources.

**Operations Research (OR)** is the analytical discipline that helps us make better decisions in light of these constraints to optimize the way we run an operation or supply chain. This is done using different modelling approaches with the objective to come up with an optimal solution, i.e., to minimize costs, to maximize profits, to increase customer satisfaction, to decrease lead times, etc.

In this course, we will be **solving real-life problems**, such as allocating production resources, planning social activities, structuring a supply chain network or setting up an airline network, by solving case studies. **You'll learn how to derive insights from these problems, summarize your findings, and make actionable recommendations** to management. We'll also be teaching you important **transferable skills** to help you succeed in this course and prepare you for upcoming academic and work adventures!

## Course Format

We are very glad to be able to offer **in-person, face-to-face** teaching this semester and will be running the course in a **hybrid format**, which was very well received last year. We're optimistic that this will be a fun, helpful, and interesting learning experience in the upcoming semester that will be robust to a variety of external circumstances which might require changes to teaching formats.

Concretely, we will have four elements for this course:
- Opening and closing sessions as well as interactive **workshops** to be taught **face-to-face**
- Weekly **exercise labs** to be held **in-person**. Except for a brief review of key contents, these will be **interactive sessions** where you will solve practical problems, not frontal lecturing
- **Five online content blocks,** with short videos, small exercises, or questions, which you complete at **your own schedule**. These replace classical, "we talk, you listen" lectures, allowing you to pause, rewind, and fast-forward content at your own pace.
- Optional **troubleshooting** sessions where we will help answer technical questions you may have, held **in-person**

**In this way, we're optimistic that we can offer you a great learning experience which caters to your learning needs, but also has the interactive elements with your fellow students and us in the faculty to keep you energized, motivated and on-track!**

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| **Prerequisites** | Interest in the field and working knowledge of quantitative approaches in business administration. |
| | This course builds on knowledge that you gathered from the course "Supply Chain Management"; thus, it is highly recommended that you have completed this or an equivalent course (for exchange students) prior to this course. |
| | Prior knowledge of Excel is recommended but can be also gained (and expanded!) throughout the course and through the **Excel skills lab**, which is an optional resource we are launching one week prior to the start of the course. |

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| **Grading** | The course will count 6 credit points (LP) according to the examination handbook from 2015. |
| | As part of our effort to adapt the course to the changing circumstances, the **assessment for the course is a portfolio**: |

- **Case Study**, completed individually as a take-home assignment **(80%)**
  - You will receive a case study, inspired by a real-world problem, which will require you to apply the learnings of the course. You'll be required to submit a written report (expect ~ 4 pages, details tbc) as well as an Excel file with the model.
- **4 short tests** on ILIAS **(20% in total)**
  - These tests will be made available at the end of units 1, 2, 3 and 5 (i.e., after the review & exercise session), you'll have two days to complete them at your discretion. Once a test is started, there is a time limit.
- Bonus points

In other words, there will **NOT be an exam** for this course. We've opted for this examination method because we believe this is the most representative and fair way for you to demonstrate your learnings from the course – we are keen to help you understand how to apply the contents of the course to practical problems, to present your findings, and to critically challenge the limitations of the models we will build.

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| **Lecturer(s)** | **Dominik Walzner** |
| | **Prof. Andreas Fügener** |
| **Lecture Hall** | **Mondays: Lecture Hall B** (Hörsaalgebäude, Universitätsstraße 33, 50931 Köln) |
| | **Tuesdays: Lecture Hall XXV** (WiSo-Gebäude, Universitätsstr. 24, 50931 Köln) |
| **Contact** | or@wiso.uni-koeln.de *(Feel free to message us in English or German)* |
| | Once the course has started, there will be a dedicated tool in the ILIAS course to raise questions. **Please check here first whether your question has already been asked/ answered or not.** |
| **Office hour** | By appointment, see details on the course page in ILIAS. |
| **Language** | All sessions are taught in English. |
| | You may answer the case study either in English or German. |

## Course Schedule

| Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|
| September 30 | October 1 | 2 | 3 | 4 |
| *Optional Excel "skills lab" videos made available to get you up to speed on basics of using Excel.* | | | | |
| 7 | 8 | 9 | 10 | 11 |
| **Opening Session – Welcome to OR** <br> *10:00 – 12:00, Hörsaal B* | **Block 1: Linear Programming & What-If Analysis** <br> (Online, Self-Study) | | | |
| 14 | 15 | 16 | 17 | 18 |
| **Lab 1 (Review & Exercise)** <br> LP & What If Analysis <br> *10:00 – 12:00, Hörsaal B* <br><br> **Optional** <br> *Individual Excel Troubleshooting* <br> *12:00 – 13:30, Hörsaal B* | **Block 2: Integer Programming** <br> (Online, Self-Study) <br><br> **DEADLINE TO REGISTER FOR "EXAMINATION" IN KLIPS @ 23:59** | | | |
| 21 | 22 | 23 | 24 | 25 |
| **Lab 2 (Review & Exercise)** <br> Integer Programming <br> *10:00 – 12:00, Hörsaal B* | **Block 3: Network Optimization** <br> (Online, Self-Study) | | | |
| 28 | 29 | 30 | 31 | November 1 |
| **Lab 3 (Review & Exercise)** <br> Network Optimization <br> *10:00 – 12:00, Hörsaal B* | **Block 4: Building advanced constraints** <br> (Online, Self-Study) | | | *BANK HOLIDAY* |
| 4 | 5 | 6 | 7 | 8 |
| **Lab 4 (Review & Exercise)** <br> **Building advanced constraints** <br> *10:00 – 12:00, Hörsaal B* | **Block 5: Ethics of Optimization** <br> (Online, Self-Study) | | | |
| 11 | 12 | 13 | 14 | 15 |
| **DEADLINE TO DE-REGISTER FOR "EXAMINATION" IN KLIPS @ 23:59** | **Workshop** <br> How to successfully solve a case study <br> *14:00 – 15:30, Hörsaal XXV* <br><br> ***Case Study released*** | | | |
| 18 | 19 | 20 | 21 | 22 |
| **Closing Session, Q&A** <br> *10:00 – 12:00, Hörsaal B* | | | | |

**DEADLINE Case Study: 23 Nov 2024**