Module catalogue for SuSe 25 and WiSe 25/26

M.Sc. Wirtschaftsinformatik

Subject to change.
It is possible that changes communicated through the School's website are not immediately entered into the module catalogue

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Modulzuordnung

Methoden

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34951	Kombinatorische Optimierung	SoSe
34954	Network Optimization	irregular
34955	Heuristics and Approximation Methods	irregular
35500	Multivariate Verfahren	WiSe
35550	Topics in Applied Econometrics	SoSe
35610	Paneldatenanalyse	SoSe
35621	Computational Statistics – Regression in R	WiSe (+SoSe)
35622	Computational Statistics – Statistical Learning in R	SoSe (+WiSe)
35777	Econometric Methods	WiSe
35780	Advanced Data Analytics	WiSe
37507	Data Analysis in R for Information Systems Research	SoSe
39734	Approximate Dynamic Programming (Reinforcement Learning)	WiSe

Wirtschaftswissenschaftliche Grundlagen

30000	Steuerplanung und Steuerwirkung	SoSe
30913	Corporate Finance und Kapitalmärkte	SoSe
31360	Wertorientiertes Controlling/Value-based Management	SoSe
31362	Unternehmensbewertung/Corporate Valuation	WiSe
31803	Finanzcontrolling I	SoSe
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32820	Organizations and Innovation Strategy	irregular
32900	Strategy for High-Tech Startups	SoSe
33160	Organizational Behavior – Unternehmensführung und Verhalten in Organisationen	SoSe
33820	Produkt-, Marken- und Kommunikationsmanagement	unregelmäßig
34540	Kundenmanagement	WiSe
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Wirtschaftsinformatik/ Information Systems

34953 Artificial Intelligence and Optimization	WiSe
34956 Masterseminar in Business Analytics	SoSe + WiSe
35002 Business Intelligence & Analytics Systems	SoSe
35005 Masterseminar AI-Based Information Systems	SoSe / WiSe
35006 Artificial Intelligence (AI)-Based Business Information Systems	WiSe
35621 Computational Statistics – Regression in R	WiSe (+SoSe)
35622 Computational Statistics – Statistical Learning in R	SoSe (+WiSe)
37500 Strategic IT Management	WiSe
37502 IT Architecture Management	SoSe
37504 IT-Services und IT-Servicemanagement	WiSe (nicht in 25/26)
37506 Master Seminar Business Information Systems	irregular
37507 Data Analysis in R for Information Systems Research	SoSe
37509 Cloud Anwendungsentwicklung und Applikationstest	WiSe
39606 Master Seminar Telecommunications and Internet Business	SoSe + WiSe
39607 Master Colloquium in Internet and Telecommunications Business	SoSe + WiSe
39612 Digital Markets and Online Platforms	WiSe
39614 Governance of Platforms and Ecosystems	unregelmäßig
39724 Masterseminar in Data Science und Optimierung	unregelmäßig
39732 Master-Seminar: Seminar in Management Science	unregelmäßig
39733 Colloquium: Master-Colloquium im Fach Management Science/ Operations and Supply Chain Management	WiSe + SoSe
39734 Approximate Dynamic Programming (Reinforcement Learning)	WiSe
39802 Masterseminar Wirtschaftsinformatik Daten- und Informationsmanagement	WiSe
39803 Strategies in the Software Industry	WiSe
39807 Management of Information Security and Privacy	WiSe
39908 Scientific Computing and Digital Reporting with Python	SoSe
39910 Financial Data Analytics and Machine Learning	SoSe
39915 Deep Learning and Text Analysis in Finance	WiSe
5622V Software-Sicherheit / System Security	SoSe
5724V Safety and Security of Critical Infrastructures	unregelmäßig
5771V Multimedia-Datenbanken	SoSe
5772 Data Modelling and Data Processing in the Internet of Things	SoSe

5777 Technologien zur Wahrung der Privatsphäre in Informationssystemen / Privacy-Preservation Technologies in Information Systems	unregelmäßig
5820 Advanced IT-Security	WiSe
5845 Search-Based Software Engineering	WiSe
5881 Privacy Enhancing Techniques	WiSe
5942 Network Science	unregelmäßig
5945 Advanced Topics in Data Science	irregular
5970V Scaling Database Systems	WiSe
5973 SQL for Data Science	irregular
6061 Introduction to Deep Learning	unregelmäßig
6064 Responsible Machine Learning	SoSe
6090 Security of Computer and Embedded Systems / Sicherheit von Rechnern und eingebetteten Systemen	WiSe
6120 Principles of AI Engineering	unregelmäßig
6123 Deep Learning for Natural Language and Code	unregelmäßig
6206 Data on the Web	unregelmäßig
6210 Semantic Data Integration	unregelmäßig

Interdisziplinäres Vertiefungsangebot

Zur persönlichen Profilbildung können in diesem Gebiet bei bestehender Fachnähe ergänzende Lehrveranstaltungen aus weiteren Studiengängen gewählt werden. Die unten aufgelisteten Lehrveranstaltungen sind grundsätzlich wählbar und sind zur Anmeldung im Campusportal freigeschaltet. Für weitere Veranstaltungen stellen Sie bitte einen formlosen schriftlichen Antrag an die Vorsitzende oder den Vorsitzenden der Prüfungskommission für den Masterstudiengang Wirtschaftsinformatik.
Beachten Sie dazu die Hinweise unter https://www.winfo.uni-passau.de/faq-masterstudium.

5874V IT-Sicherheitsrecht	WiSe
39720 Fundamentals of Business Analytics	WiSe + SoSe

Definitions

The following abbreviations are used in this document:

FFA	**=**	**Subject-specific language programme**
FFP	**=**	**Subject-specific language exam**
H	**=**	**Hours**
LP	**=**	**ECTS credits (European Credit Transfer and Accumulation System)**
SE	**=**	**Seminar**
SWS	**=**	**Contact teaching hours per week during the semester**
Ü	**=**	**Exercise course**
V	**=**	**Lecture**
WÜ	**=**	**Wissenschaftliche Übung (a type of seminar)**

Preamble

Workload calculation:

A module's ECTS credit load is allocated based on the amount of work students can, on average, expect to put in to successfully complete the module: one credit point corresponds to approx. 30 hours of work. This average is applied uniformly across all subjects and course types in this degree programme.

Since the general political debate concerning the Bologna Process (i.e. the adoption of the bachelor/master system), including among those setting higher-education policy, has shown that modularised degree programmes are generally perceived as overly school-like and un-academic, we have opted for a relatively high number of credits in this model, trusting in the ability of our students to make good use of the freedom to learn independently.

The conceptual philosophy of the School of Business, Economics and Information Systems seeks to address to key concerns: to create degree programmes with as clear and straightforward a structure as possible, and to bring about the greatest possible freedom for students' own, independent study. This requires an intuitive credit-point system for all course types that takes into account the number of contact teaching hours per week as well as the total workload (5 ECTS credits for modules consisting of a lecture and an exercise course ("V+Ü"), and 7 ECTS credits for master's seminars). The courses taught at the School of Business, Economics and Information Systems have been designed such that the majority of the workload is allocated (in the form of ECTS credits) for students' self-study – i.e. the preparation and follow-up study of the courses they attend.

Examiners:

The module convenors named in this module catalogue are, at the same time, the examiners for their modules.

Compulsory attendance:

In principle, attendance is not compulsory. However, regular attendance is generally compulsory for seminars and workshops. Please always check the information in Stud.IP to find out whether compulsory attendance is in effect for each module.

Exam resit opportunities:

Resits are possible for examination modules in accordance with the examination and study regulation for the M.Sc. Wirtschaftsinformatik programme.

Seminars:

In principle, chairs offer seminars on a regular basis, but there are exceptions. Please check the seminar announcements on the chairs' websites.

Module

3000 Steuerplanung und Steuerwirkung / Tax effects

Module number
30000
Course name
Tax effects
Module coordinator/ examiner(s)
Prof. Dr. Markus Diller

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
262600	5	2
Availability	**Duration**	**Recommended semester**
Every summer semester	1 semester	

Workload
Lecture 2 SWS (30 hours of attendance and 45 hours of individual work) Exercise 2 SWS (30 hours of attendance and 45 hours of individual work). 15 semester weeks are counted (14 lecture weeks + 1 examination week) and each SWS is counted at 60 minutes.
Module applicability
Wirtschaftswissenschaftliche Grundlagen
LPO I applicability
Recommended prerequisites
Bachelor's degree in economics or business-related studies. Basic tax knowledge in the area of income taxes (EStG, KStG) is recommended.
Requirements
Language of instruction
English

Content
The module deals with the impact of taxes on business decisions. In particular, the module discusses the impact of taxation on after-tax net present value in different scenarios and, based on this, investment-neutral tax systems (cash flow tax, economic profit) and their interrelationship with forward-looking effective tax rates.
Intended learning outcomes (ILOs)
After successfully completing the module: • Students explain multi-period tax effects using the after-tax NPV and quantify complex, investment-theoretic tax effects.

• understand the concept of tax neutrality and its relationship to forward-looking effective tax rates. •
Teaching methods
• Lecture with seminar character and interactive elements such as discussions and group work • Working on exercises and suitable case studies.
Required attendance
Examination (type of examination, scope)
Exam 60 min, 100%
Overall grade relevance
Exam resit opportunities
In the event of failure, all courses may be repeated in accordance with § 6 of the Study and Examination Regulations.
Recommended reading
The recommended literature will be announced by the respective lecturer in the course.
Additional notes

30913 Corporate Finance und Kapitalmärkte

Module number
30913
Course name
Corporate Finance und Kapitalmärkte / Corporate Finance and Capital Markets
Module coordinator
Prof. Dr. Oliver Entrop

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
262230	5	2+2
Availability	**Duration**	**Recommended semester**
Every summer semester	1 semester	1-3

Workload
Lecture 2 SWS (30 h presence and 45 h individual working hours) Exercise session (30 h presence and 45 h individual working hours)
Module applicability
Wirtschaftswissenschaftliche Grundlagen
Reference to the LPO I
Recommended prerequisites
Introductory module in Finance
Requirements
Language of instruction
English

Content
• Advanced methods of company valuation (APV, entity, equity approach, autonomous vs. value-based financing, annuity vs. two-phase model, equity costs and beta leverage, capital structure, taxes, multiplier method) • Determinants of stock price performance (basic performance measures, multifactor models, size and value factors, advanced factors such as liquidity) • Risk-oriented corporate management concepts (RORAC, RAROC, optimal capital allocation for different target values) • Optimal risk policy and hedging (basics, foreign currency risks, hedging of currency risks, risk policy for perfect and unperfect markets, risk policy and optimal capital structure, empirical evidence: company value and risk policy for currency risks)
Intended learning outcomes (ILOs)
Students who have successfully completed the module, • identify and interpret in-depth methods of company valuation and characterize the possibilities and limitations of different methods. They apply these methods to specific problems.

• identify and interpret the influence of various value determinants on the share price performance of companies and apply methods of external performance measurement. • identify and interpret capital market-oriented methods for internal corporate management and capital allocation and characterize the possibilities and limitations of the methods. • identify and interpret the theoretical foundations of optimal corporate risk policy and implement specific risk reduction decisions using the appropriate financial instruments.
Teaching methods
Interactive lecture Excercises
Required attendance
Examination (type of examination, scope)
Exam 60 minutes (100%)
Overall grade relevance
Exam resit opportunities
According to the examination and study regulations for the Master's degree program.
Recommended reading
Given in class
Additional notes

31360 Wertorientiertes Controlling / Value-based Management

Module number
31360
Course name
Value-based Management
Module coordinator/ examiner(s)
Prof. Dr. Robert Obermaier

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
262670	5	4
Availability	**Duration**	**Recommended semester**
Every summer semester	1 semester	

Workload
Lecture: 2 SWS (30 hours attendance time; 45 hours individual work time) Tutorial: 2 SWS (30 hours attendance time; 45 hours individual work time) We calculate with 15 semester weeks (14 lecture weeks + 1 examination week) and each SWS is included in the calculation with 60 minutes.
Module applicability
Wirtschaftswissenschaftliche Grundlagen
LPO I applicability
Recommended prerequisites
Basic knowledge of controlling, reporting, financing and investment accounting.
Requirements
Language of instruction
English or German

Content
Value-based management is a fundamental and widely adopted management accounting practice, guiding organizations toward long-term maximization of shareholder value. The course covers key concepts and frameworks of shareholder value and value-based management to support value-based decision-making in organizations. Topics include economic profit and residual income as foundations for value-based performance measurement, regulatory requirements in the context of corporate governance, and value-based compensation systems for aligning management incentives. Beyond economic considerations, social and environmental aspects of management decision-making are discussed.
Intended learning outcomes (ILOs)
Students who have taken part in the module Value-based Management, • analyze and critically evaluate corporate objectives from an economic perspective, considering both theoretical frameworks and practical implications within the context of corporate governance;

• demonstrate a profound understanding of the design, implementation and inherent complexities of value-based controlling systems aligned with shareholder value principles, while critically assessing their limitations and potential trade-offs; • evaluate the complexities of performance measurement systems that align with shareholder value principles, addressing methodological challenges and their impact on managerial decision-making; • critically assess and develop recommendations for incentive-compatible management compensation schemes, considering their strategic alignment, incentive structure and implications for management retention and shareholder cost.
Teaching methods
• Interactive lecture • Exercises and case studies
Required attendance
Examination (type of examination, scope)
a) Written exam, 60 minutes, or b) Written exam, 60 minutes + optional semester-long performance (subject to change)
Overall grade relevance
Exam resit opportunities
In the event of failure (grade worse than 4.0), all courses can be repeated in accordance with § 9 of AStuPO.
Recommended reading
Additional notes
International students are welcome! The exam can be written in English or German. The language of lectures and tutorials will be determined in the first lecture.

31362 Unternehmensbewertung

Module number
31362
Course name
Corporate Valuation
Module coordinator/ examiner(s)
Prof. Dr. Robert Obermaier

Examination number	Credit points (ECTS)	Hours per week (SWS)
262710	5	4
Availability	**Duration**	**Recommended semester**
Every winter semester	1 semester	

Workload
Lecture: 2 SWS (30h present time, 45h own working time) Exercise: 2 SWS (30h present time, 45h own working time) The calculation is based on 15 semester weeks (14 lecture weeks + 1 examination week) and each SWS is counted as 60 minutes.
Module applicability
Wirtschaftswissenschaftliche Grundlagen
LPO I applicability
Recommended prerequisites
Basic knowledge of accounting and capital budgeting is recommended.
Requirements
Language of instruction
English or German

Content
The lecture “Corporate Valuation” deals with one of the most interesting and complex areas of business administration. After a systematization of the reasons and purposes for the valuation of entire companies or parts of companies, an overview of the theoretical foundations and relevant components of corporate valuation is provided. The lecture focuses on the theoretically and methodically sound application of Discounted Cash-Flow (DCF) approaches and the corresponding determination of adequate cost of capital rates. Finally, advanced research topics in the field of corporate valuation and practitioner standards (IDW S1) are discussed.
Intended learning outcomes (ILOs)
After successful participation in the course “Corporate Valuation”, students • know the different occasions and purposes for which companies or parts of companies are valuated. • understand the theoretical underpinnings and the formal relationships between the Discounted Cash-Flow (DCF) approaches.

• apply their conceptual and methodological knowledge to determine appropriate valuation-relevant cash-flows and cost of capital rates. • combine their theoretical, conceptual, and methodical knowledge by applying different DCF approaches in a reflective and suitable manner. • analyze, critically evaluate, and prepare company valuations, whether as controllers, auditors or investment bankers. • transfer their knowledge of valuation theory to the areas of investment controlling, mergers & acquisitions, and value-based management of companies and business units.
Teaching methods
Interactive lecture Completion of exercises and case studies
Required attendance
Examination (type of examination, scope)
a) Written exam 100% or b) Written exam 90% + 10% through optional semester-accompanying performance (subject to reservation; if the number of participants is suitable, the chair can offer a voluntary semester-accompanying assignment, through which up to 6 bonus points (10% of the final exam) can be acquired. These are added to the points achieved in the final exam).
Overall grade relevance
Exam resit opportunities
In the event of failure (grade worse than 4.0), all courses can be repeated in accordance with § 9 of AStuPO.
Recommended reading
Additional notes
International students are welcome! The exam can be written in English or German. The language of lectures and tutorials will be determined in the first lecture. Guest lectures by practitioners are planned. The chair reserves the right to offer a voluntary graded assignment during the semester.

31803 Finanzcontrolling I

Modulnummer
31803
Veranstaltungstitel
Finanzcontrolling I
Modulverantwortliche*r / Prüfer*innen
Prof. Dr. Niklas Wagner

Prüfungsnummer	**ECTS**	**SWS**
200414	5	2
Modulangebot	**Zeitdauer des Moduls**	**Empfohlenes Studiensemester**
Jedes Sommersemester, Fortführung in Finanzcontrolling II	1 Semester	

Workload
Zusammensetzung / Aufteilung des Workload: Veranstaltungen Vorlesung 2 SWS, Übungen 1 SWS = Summe 3 SWS, 5 ECTS Aufteilung des Workload (zu berechnen in Stunden à 60 Minuten auf 15 Semesterwochen, d.h. 14 Vorlesungs- + 1 Prüfungswoche) Präsenzzeit: Vorlesung 30, Übung 15, Eigenarbeitszeit: Vorlesung 70, Übung 35 Es wird mit 15 Semesterwochen gerechnet (14 Vorlesungs- + 1 Prüfungswoche) und jede SWS geht mit 60 Minuten in die Berechnung ein.
Verwendbarkeit
Wirtschaftswissenschaftliche Grundlagen
Bezug zur LPO I
Empfohlene Voraussetzungen
Gem. § 3 der Studien- und Prüfungsordnung für den Masterstudiengang Wirtschaftsinformatik. Inhalte des Moduls Corporate Finance sowie solide Grundkenntnisse in Statistik und Wahrscheinlichkeitstheorie werden empfohlen.
Verpflichtende Voraussetzungen
Bachelor-Abschluss in einem wirtschaftswissenschaftlichen oder den Wirtschaftswissenschaften nahen Studiengang
Unterrichtssprache
Deutsch

Inhalt
Die aus dem Grundmodul Corporate Finance bekannten Konzepte Kapitalstruktur, Barwert und Risiko-Return Profil werden in stochastische Kapitalmarktmodelle eingebettet, um auf dieser Basis die fortgeschrittenen Konzepte des Risikomanagements wie Hedging, Einsatz von Derivaten und Value at Risk in ihrer Funktionsweise zu erschließen. Dabei werden anhand folgender spezieller

Inhalte Charakteristika einzelner Instrumente sowie die Dynamik der Ausdifferenzierung der Instrumentenvielfalt dargelegt: • Anleihebewertung und Asset-Liability Management mittels Duration und Konvexität • Begriffe der Finanzmarktstochastik: Arbitrage, Hedging-Strategien, stochastische Prozesse, Risikoneutrale Bewertung • Bewertung von Derivaten im Black-Scholes-Merton Modell • Risikomanagement auf der Basis von Value at Risk • Prinzipien der Bonitätsbeurteilung und Kreditrisikomessung • Analyse von Rating-Methoden
Lernergebnisse Lernziele
Studierende, die erfolgreich an dem Model „Finanzcontrolling I“ teilgenommen haben, • wissen, dass die fundierte Risiko-Return Analyse im Zentrum vieler praktischer Entscheidungen steht. • kennen die zwingende sachliche Kontinuität zwischen den traditionellen Konzepten der Finanzierung und deren moderner Ausdifferenzierung. • erlernen die Ambivalenz von Arbitrage- und Hedgingstrategien, die in die Struktur des Risiko-Return trade-offs eingelassen ist und können deren Zielsetzung beurteilen. • verstehen, dass das Bewertungsproblem für Derivate sich auch unabhängig von der Entwicklung innovativer Kapitalmarktprodukte stellt, da viele Aspekte der Finanzierungsentscheidung synthetisch durch Auszahlungsprofile von Derivaten replizierbar sind. • erläutern in fundierter Weise, wie die Komplexität von Instrumenten mit Bewertungsaufwand, Bewertungsunsicherheit und Marktdatenbedarf zusammenhängt. • bearbeiten selbstständig Problemstellungen im Bereich des Finanzcontrollings, insbesondere im Rahmen einer Master-Arbeit.
Lehr- und Lernformen
Interaktiver Frontalunterricht, Bearbeitung von Übungsaufgaben, Lösung und Präsentation von Übungsaufgaben
Anwesenheitspflicht
Prüfungsleistung (Prüfungsform, Umfang, Gewichtung)
Endklausur 60 Minuten, Endklausur: 100%
Gesamtnotenrelevanz
Wiederholungsmöglichkeit
Bei Nichtbestehen können alle Veranstaltungen gemäß § 6 der Fachstudien- und -prüfungsordnung wiederholt werden.
Literatur
Weitere Hinweise
Das Modul wird durch Finanzcontrolling II fortgesetzt. Dieses Modul kann von Studierenden in den Methoden bzw. den Grundlagen oder in der Vertiefung Accounting, Finance and Taxation eingebracht werden.

31814 Finanzcontrolling II

Modulnummer
31814
Veranstaltungstitel
Finanzcontrolling II
Modulverantwortliche*r / Prüfer*innen
PD Dr. Harald Kinateder, Prof. Dr. Niklas Wagner

Prüfungsnummer	**ECTS**	**SWS**
262140	5	2
Modulangebot	**Zeitdauer des Moduls**	**Empfohlenes Studiensemester**
Jedes Wintersemester	1 Semester	

Workload
Aufteilung des Workload (zu berechnen in Stunden à 60 Minuten auf 15 Semesterwochen, d.h. 14 Vorlesungs- + 1 Prüfungswoche) Vorlesung 2 SWS (30 Std. Präsenzzeit und 70 Std. Eigenarbeitszeit) Übung 1 SWS (15 Std. Präsenzzeit und 35 Std. Eigenarbeitszeit) Es wird mit 15 Semesterwochen gerechnet (14 Vorlesungs- + 1 Prüfungswoche) und jede SWS geht mit 60 Minuten in die Berechnung ein.
Verwendbarkeit
Wirtschaftswissenschaftliche Grundlagen
Bezug zur LPO I
Empfohlene Voraussetzungen
Gem. § 3 der Studien- und Prüfungsordnung für den Masterstudiengang Wirtschaftsinformatik. Solide Grundkenntnisse in Statistik und Wahrscheinlichkeitstheorie werden empfohlen.
Verpflichtende Voraussetzungen
Bachelor-Abschluss in einem wirtschaftswissenschaftlichen oder den Wirtschaftswissenschaften nahen Studiengang
Unterrichtssprache
Deutsch

Inhalt
Zielsetzung des Moduls „Finanzcontrolling II“ ist den Studierenden mit den Methoden des Managements von finanziellen Risiken vertraut zu machen. Insbesondere werden die neusten Modelle im Bereich des Marktrisiko und -liquiditäts-managements sowie der Adressierung von systemischen Risiken behandelt. Der Schwerpunkt der Veranstaltung liegt dabei auf der Anwendung der entsprechenden Methoden sowie den zugrundeliegenden statistischen und ökonometrischen Modellen. Zu den behandelten Themen gehören unter anderem: • Ermittlung des regulatorisches Kapital gemäß des Basel Akkords • Fundamentale Eigenschaften von Risikomaßen: Kohärenz und Elicitability • Value-at-Risk

• Expected Shortfall • Marktliquiditätsmessung mittels quantitativer Ansätze • Prognose finanzieller Risiken • Entscheidungstheorie unter Unsicherheit • Grundlagen der Portfoliooptimierung
Lernergebnisse Lernziele
Studierende, die erfolgreich an dem Model „Finanzcontrolling II“ teilgenommen haben, • kennen die verschiedenen Arten von finanziellen Risiken. • wissen welche Eigenschaften quantitative Risikomaße haben müssen, damit sie für das Risikomanagement geeignet sind. • erlernen die gängigen Methoden des Managements finanzieller Risiken. • wenden quantitative Risikomaße an, um Prognosen des zukünftigen Marktrisikos zu erhalten. • erläutern wie finanzielle Entscheidungen unter Berücksichtigung von Untersicherheit getroffen werden. • bearbeiten selbstständig Problemstellungen im Bereich des Finanzcontrollings, insbesondere im Rahmen einer Master-Arbeit.
Lehr- und Lernformen
Interaktiver Frontalunterricht. Bearbeitung von Übungsaufgaben. Lösung und Präsentation von Übungsaufgaben.
Anwesenheitspflicht
Prüfungsleistung (Prüfungsform, Umfang, Gewichtung)
Endklausur 60 Minuten Endklausur: 100%
Gesamtnotenrelevanz
Wiederholungsmöglichkeit
Bei Nichtbestehen können alle Veranstaltungen gemäß § 6 der Fachstudien- und -prüfungsordnung wiederholt werden.
Literatur
Weitere Hinweise
Implementierung der theoretischen Modelle anhand von Fallbeispielen mit realen Daten. Kann unabhängig von Finanzcontrolling I gehört werden.

32820 Organizations and Innovation Strategy

Module number
32820
Course name
Organizations and Innovation Strategy
Module coordinator
Prof. Dr. Carolin Häussler, Dr. Patrick Figge

Examination number	Credit points (ECTS)	Hours per week (SWS)
264190	5	4
Availability	**Duration**	**Recommended semester**
irregular	1 semester	

Workload
Lecture: 2 SWS (30 hrs. class instruction, 65 hrs. self-study) Exercise Class: 2 SWS (15 hrs. class instruction, 40 hrs. self-study) Calculation is based on: every hr. per semester week corresponds to 60 minutes. One semester presumably consists of 15 weeks, i.e., 14 course and 1 exam week
Module applicability
Wirtschaftswissenschaftliche Grundlagen
Reference to the LPO I
Recommended prerequisites
Requirements
Language of instruction
English

Content
This course focuses on the organizational and strategic challenges companies face in order to obtain a sustainable competitive advantage. It engages in an application-oriented analysis of intercompany interaction along the value chain. The course discusses how companies organize to innovate and decide for strategic moves in order to attain competitive advantage. Amongst others, topics covered by this course will be pricing decisions, market entry decisions, intellectual property protection, network effects, and vertical relations within the value chain.
Intended learning outcomes (ILOs)
Students who have successfully participated in the module "Organizations and Innovation Strategy", • explain key theoretical concepts of management, competition and strategy science. • combine and compare knowledge of theoretical concepts with the understanding of emerging trends. In so doing, students discuss resulting consequences for strategic

decision-making in organizations, e.g., the strategic implications of network effects on the management of platform ecosystems. • perform analyses to quantify abstract decision-making scenarios through game theoretic and economic models (e.g., simultaneous and sequential decision-making games). • assess corporate strategies through analyzing competitive environments surrounding organizations. • develop adequate recommendations for organizations.
Teaching methods
• Interactive lecture • Discussion of contents • Discussion of questions and case studies linked to the organizational and innovation strategy of companies • Interactive surveys and classroom experiments
Required attendance
Examination (type of examination, scope)
Written exam at the end of the course (60 Minutes)
Overall grade relevance
Exam (100%)
Exam resit opportunities
Gem. der Prüfungs- und Studienordnung für den Masterstudiengang
Recommended reading
Additional notes
• This lecture replaces the lecture “Organizational and Competitive Strategy” (you cannot include both courses in your degree program) • Guest lectures, integration of videos, case studies • A weekly exercise class (#32825) will supplement the lecture by repeating and intensifying core concepts. • The module is applicable to the Certificate Program in Digital Technology and Entrepreneurship: Entrepreneurial Pathfinder.

32900 Strategy for High-Tech Startups

Module number
32900
Course name
Strategy for High-Tech Startups
Module coordinator
Prof. Dr. Carolin Häussler, Dr. Patrick Figge

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
264509	5	2+2
Availability	**Duration**	**Recommended semester**
Every summer semester	1 semester	

Workload
Lecture: 2 SWS (30 hrs. class instruction, 65 hrs. self-study) Exercise Class: 2 SWS (15 hrs. class instruction, 40 hrs. self-study) Calculation based on: every hr. per semester week corresponds to 60 minutes. One semester presumably consists of 15 weeks, i.e., 14 course and 1 exam week.
Module applicability
Wirtschaftswissenschaftliche Grundlagen
Reference to the LPO I
Recommended prerequisites
In accordance with § 3 of the study and examination regulation for the master degree program Business Administration.
Requirements
Language of instruction
English

Content
Founding one's own company requires not only a promising business idea but also a successful management of upcoming strategic and organizational challenges. Successfully performing these management tasks is a substantial part of being a successful entrepreneur. This course focuses on these management tasks concerning the founding of a company, especially with regard to high-technology startups. Inspired by the real founding process, the course starts with an introduction to venture opportunities, concepts, and strategies. Following this introduction, concepts on venture formation, organizational planning, as well as technology development strategy are discussed in the context of high-technology start-ups. The course closes with answers to the question how to finance and how to build the venture.

Intended learning outcomes (ILOs)
Students who have successfully participated in the module "Strategy for High-Tech Startups", • explain and apply the key concepts and theories in entrepreneurship. • outline core findings of most influential and recent scientific studies in the field of entrepreneurship. • transfer knowledge of entrepreneurship theories into in-class discussions so that they can interpret recent developments in entrepreneurship with a particular focus on the influences of digitalization, new technologies, and strategic implications for high-tech startups. • analyze different entrepreneurial strategies and assess their implications, e.g., for the economy. • develop adequate suggestions for entrepreneurial high-tech organizations.
Teaching methods
• Interactive lecture • Discussion of Contents • Discussion of case studies
Required attendance
Examination (type of examination, scope)
Written exam at the end of the course (60 Minutes)
Overall grade relevance
Exam (100%)
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
• Byers, T.H./Dorf, R. /Nelson, A.J. (2010): Technology Ventures – From Idea to Enterprise, McGraw-Hill. • Selection of essays, articles, and case-studies
Additional notes
• Guest lectures, integration of videos, case studies. • A weekly exercise class (#32905) will supplement the lecture by repeating and intensifying core concepts. • The module is applicable to the Certificate Program in Digital Technology and Entrepreneurship: Entrepreneurial Pathfinder.

33160 Organizational Behavior – Unternehmensführung und Verhalten in Organisationen

Modulnummer
33160
Veranstaltungstitel
Organizational Behavior – Unternehmensführung und Verhalten in Organisationen
Modulverantwortliche*r / Prüfer*innen
Prof. Dr. Marina Fiedler

Prüfungsnummer	**ECTS**	**SWS**
264170	5	2 (+2 für Übung)
Modulangebot	**Zeitdauer des Moduls**	**Empfohlenes Studiensemester**
jedes Sommersemester	1 Semester	1.-4. Semester

Workload
Aufteilung des Workload (zu berechnen in Stunden à 60 Minuten auf 15 Semesterwochen, d.h. 14 Vorlesungs- + 1 Prüfungswoche)
Verwendbarkeit
Wirtschaftswissenschaftliche Grundlagen
Bezug zur LPO I
Empfohlene Voraussetzungen
Gem. § 3 der Studien- und Prüfungsordnung für den Masterstudiengang Wirtschaftsinformatik. Bachelor-Abschluss in einem wirtschaftswissenschaftlichen oder einem den Wirtschaftswissenschaften nahen Studiengang.
Verpflichtende Voraussetzungen
Keine
Unterrichtssprache
Deutsch

Inhalt
Zahlreiche Untersuchungen zeigen, dass das Verhalten von Mitarbeitenden Einfluss auf so zentrale unternehmerische Kenngrößen wie Mitarbeitenden-Fluktuation, Gewinn und Umsatz hat und so nachhaltige Wettbewerbsvorteile für das Unternehmen schaffen kann. Ziel der Veranstaltung ist die Hervorhebung der Bedeutung und Wichtigkeit von Unternehmensführung und Verhalten in Organisationen mit besonderem Bezug auf Wandel in Organisationen. Hierzu werden im Wesentlichen folgende Aspekte behandelt: • Führungsstile • Kommunikation und Feedback • Verhandlungsmanagement • Konfliktmanagement • Teamwork und Diversität Nähere Informationen zum Modul finden sich jeweils zum Start der Veranstaltung in Stud.IP.

Lernergebnisse Lernziele
Nach erfolgreicher Teilnahme am Modul sind die Studierenden in der Lage: • Einflussfaktoren für das Verhalten von Führungskräften zu bestimmen • Zusammenhänge und Wichtigkeit von Führungsverhalten in Organisationen zu verstehen • Dynamiken des Verhaltens in Organisationen anhand aktueller Trends zu beurteilen
Lehr- und Lernformen
Interaktiver Frontalunterricht Gastvorträge von Expertinnen und Experten aus der Praxis Erarbeitung von eigenen Tools zu den verschiedenen Themenbereichen
Anwesenheitspflicht
Prüfungsleistung (Prüfungsform, Umfang, Gewichtung)
Bei dieser Veranstaltung handelt es sich um eine Portfolio-Veranstaltung. Die Gesamtnote setzt sich aus zwei Teilleistungen zusammen: Teilleistung 1: Erstellung einer Gruppenarbeit, 25 Punkte Teilleistung 2: 60-minütige schriftliche Klausur, 60 Punkte Gesamtnote: Insgesamt (Teilleistung und Klausur) sind maximal 85 Punkte zu erreichen, woraus sich die Gesamtnote berechnet. Beachten Sie hierfür bitte die aktuellen Hinweise in der Veranstaltung sowie in Stud.IP.
Gesamtnotenrelevanz
Wiederholungsmöglichkeit
Bei Nichtbestehen können alle Veranstaltungen gemäß § 6 der Fachstudien- und -prüfungsordnung wiederholt werden.
Literatur
Weitere Hinweise
Starke Unternehmensführungskompetenzen und ein fundiertes Verständnis für organisationales Verhalten sind entscheidend für den beruflichen Erfolg – sowohl in Führungspositionen als auch in der Teamarbeit. Diese Vorlesung verfolgt einen **wissenschaftsorientierten Ansatz**, um die **Bedeutung und Implikationen von Unternehmensführung und Verhalten in Organisationen** insbesondere vor dem Hintergrund der **digitalen Transformation** zu analysieren. Die Veranstaltung vermittelt **fachliche Kompetenzen** im Bereich **organisationales Verhalten und Unternehmensführung**. Dazu gehören **Modelle der Führungsstilforschung, Kommunikationsmodelle und -theorien, Feedbackmechanismen, Verhandlungsmanagement sowie Konfliktlösungstechniken**. Studierende erarbeiten sich ein fundiertes Verständnis dieser Konzepte und lernen, sie **evidenzbasiert auf reale Unternehmenssituationen anzuwenden**. Neben dem Erwerb fachlicher Grundlagen stehen **methodische Kompetenzen** im Fokus. Dazu zählen **kritische Reflexion, analytische Problemlösung und datenbasierte Entscheidungsfindung**, die dazu beitragen, Managementherausforderungen systematisch zu bewerten und fundierte Strategien zu entwickeln. Zudem wird **die Fähigkeit zur wissenschaftlichen Analyse und zur Anwendung empirischer Forschungsergebnisse auf praxisrelevante Fragestellungen** gefördert. Durch **interaktive Vorlesungen und eine Übung** wird nicht nur ein umfassendes Verständnis für Unternehmensführung und organisationales Verhalten geschaffen, sondern auch die Entwicklung **sozialer Kompetenzen** unterstützt. Studierende verbessern gezielt ihre **Kommunikationsfähigkeit, Teamarbeit und interkulturelle Sensibilität**, indem sie Theorien und Methoden in Gruppen diskutieren und auf praktische Fallbeispiele anwenden.

Im Rahmen des Gruppenprojekts wird zudem **generative KI gezielt eingesetzt** – sei es zur **Unterstützung von Kommunikationsstrategien, zur Optimierung von Verhandlungsprozessen oder zur Analyse von Konfliktlösungen**. Gleichzeitig erfolgt eine **kritische Reflexion der Grenzen und Potenziale von KI** in diesen Bereichen. Dies stärkt nicht nur die **digitale Kompetenz**, sondern auch die **Innovationsfähigkeit und den verantwortungsbewussten Umgang mit KI-gestützten Technologien**.

Besonderer Wert wird auf **kritische Reflexion und Selbstständigkeit** gelegt. Die Studierenden werden dazu ermutigt, **eigenständig fundierte Entscheidungen zu treffen, Unsicherheiten in der Führungspraxis zu bewältigen und sich mit ethischen Fragestellungen auseinanderzusetzen**.

Die Gesamtnote setzt sich aus einer **Gruppenleistung (30 %) und einer schriftlichen Klausur (70 %)** zusammen. Die Klausur kann auf **Deutsch oder Englisch** geschrieben werden.

Internationale Studierende sind willkommen! Die Vorlesung wird auf **Deutsch** gehalten, jedoch stehen **KI-generierte englische Audioübersetzungen** zur Verfügung. Beiträge in **deutscher und englischer Sprache** sind ausdrücklich erwünscht. Bitte beachten Sie die aktuellen Hinweise in der Veranstaltung sowie in Stud.IP.

33820 Produkt-, Marken und Kommunikationsmanagement

Modulnummer
33820
Veranstaltungstitel
Produkt-, Marken und Kommunikationsmanagement
Modulverantwortliche*r / Prüfer*innen
Prof. Dr. Dirk Totzek

Prüfungsnummer	**ECTS**	**SWS**
264950	5	2
Modulangebot	**Zeitdauer des Moduls**	**Empfohlenes Studiensemester**
Dreisemesterturnus	1 Semester	

Workload
Vorlesung 2 SWS (30 Std. Präsenz- und 120 Std. Eigenarbeitszeit) Es wird mit 15 Semesterwochen gerechnet (14 Vorlesungs- und 1 Prüfungswoche) und jede SWS geht mit 60 Minuten in die Berechnung ein.
Verwendbarkeit
Wirtschaftswissenschaftliche Grundlagen
Bezug zur LPO I
Empfohlene Voraussetzungen
Grundlegende Kenntnisse in Marketing und Modulen des Gebiets Methoden (z.B. „Multivariate Verfahren“) werden empfohlen.
Verpflichtende Voraussetzungen
Unterrichtssprache
Deutsch

Inhalte
• Präferenztheoretische Grundlagen des Konsumentenverhaltens • Zentrale Entscheidungsfelder der Ausgestaltung und Führung von Produktprogrammen • Zentrale Entscheidungsfelder der Gestaltung und Führung von Marken • Zentrale Entscheidungsfelder und Instrumente des Kommunikationsmanagements • Instrumente zur Budgetierung von Kommunikationsausgaben • Modellierung und Messung der Kommunikationswirkung
Lernergebnisse Lernziele
Studierende, die am Modul „Produkt-, Marken und Kommunikationsmanagement“ teilgenommen haben, • erläutern zentrale Konzepte und Methoden zur Führung von Produktprogrammen und Marken. • wenden Methoden zur Bewertung und Steuerung von Marken an. • führen Messungen zur Wirkung von Kommunikationsmaßnahmen durch. • entwickeln optimale Verteilungen von Kommunikationsbudgets.

• beurteilen zentrale Vor- und Nachteile unterschiedlicher Kommunikationsinstrumente. • entwickeln ein integriertes und kritisches Verständnis von Markenführung und effektiver Marketingkommunikation vor dem Hintergrund des aktuellen Forschungsstands.
Lehr- und Lernformen
Interaktiver Frontalunterricht ergänzt durch Praxisvorträge
Anwesenheitspflicht
Prüfungsleistung (Prüfungsform, Umfang)
Schriftliche Klausur (Dauer 60 Minuten) Gewichtung: 100%
Gesamtnotenrelevanz
Wiederholungsmöglichkeit
jeweils im folgenden Semester; Bei Nichtbestehen können alle Veranstaltungen gemäß § 6 der Fachstudien- und -prüfungsordnung wiederholt werden.
Literatur
Basisliteratur: Homburg, Ch. (2020), Marketingmanagement, 7. Aufl., Wiesbaden Spezielle Literatur zu den einzelnen Kapiteln wird in der Vorlesung bekannt gegeben. Ausgewählte Artikel als Pflichtlektüre.
Weitere Hinweise

34540 Kundemanagement / Customer Relationship Management

Module number
34540
Course name
Kundenmanagement / Customer Relationship Management
Module coordinator/ examiner(s)
Prof. Dr. Jan Hendrik Schumann

Examination number	Credit points (ECTS)	Hours per week (SWS)
264940	5	2
Availability	**Duration**	**Recommended semester**
Every winter semester	1 semester	

Workload
Lecture 2 SWS (30 hours attendance time and 120 hours individual work time)
Module applicability
Wirtschaftswissenschaftliche Grundlagen
LPO I applicability (only for Teacher Education Programmes)
Recommended prerequisites
Bachelor's degree in an economics or business-related degree program. Basic knowledge of marketing is advantageous.
Requirements
Language of instruction
English

Content
The lecture covers the basics of (data-based) customer management. As part of the lecture, students learn about typical customer management problems and how to solve them. Basic methods and concepts (e.g. customer acquisition, cross-selling, customer loyalty, complaint management and churn) and their implementation in practice are discussed.
Intended learning outcomes (ILOs)
Students who have participated in the course "Customer Relationship Management" ... - ... understand the CRM approach and concepts of value-oriented customer management. - ... internalize the difference between past-based customer evaluation and forecasted customer evaluation as well as their respective strengths and weaknesses. - ... know important customer management strategies and key figures. - ... understand the specific challenges that the introduction of value-oriented customer customer management and know suitable approaches to meet them.

- ... take a critical look at typical customer management scenarios. - ... derive suitable customer management strategies based on the key variables of customer lifetime value and customer equity.
Teaching methods
Required attendance
Examination (type of examination, scope)
Written exam at the end of the semester (duration: 60 minutes) Weighting of the individual performances in the module grade: Final exam 100%
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
Additional notes

34730 Konsumentenverhalten

Modulnummer
34730
Veranstaltungstitel
Konsumentenverhalten
Modulverantwortliche*r / Prüfer*innen
Prof. Dr. Jan Schumann

Prüfungsnummer	**ECTS**	**SWS**
264840	5	2
Modulangebot	**Zeitdauer des Moduls**	**Empfohlenes Studiensemester**
Jedes Sommersemester	1 Semester	

Workload
Vorlesung = 2 SWS (30 Std. Präsenzzeit + 120 Std. Eigenarbeitszeit)
Verwendbarkeit
Wirtschaftswissenschaftliche Grundlagen
Bezug zur LPO I
Empfohlene Voraussetzungen
Gem. § 3 der Studien- und Prüfungsordnung für den Masterstudiengang Business Administration. Grundkenntnisse in "Marketing" werden empfohlen.
Verpflichtende Voraussetzungen
Unterrichtssprache
Deutsch

Inhalte
Das Modul gibt einen Überblick über konsumrelevante Wahrnehmungs-, Bewertungs- und Entscheidungsprozesse im Rahmen der individuellen Informationsverarbeitung. Hierbei werden aktuelle Erkenntnisse aus der Motivations-, Emotions-, Wahrnehmungs- und Sozialpsychologie berücksichtigt und aus einer problem- und managementorientierten Perspektive dargestellt. Zahlreiche Beispiele illustrieren, wie diese grundlegenden theoretischen Prinzipien in der Unternehmenspraxis zur Anwendung kommen können.
Lernergebnisse Lernziele
Studierende, die an dem Modul „Konsumentenverhalten“ teilgenommen haben, … - … verinnerlichen wesentliche Aussagen der zentralen verhaltenswissenschaftlichen Theorien. - … wenden verhaltenswissenschaftliche Theorien auf Erkenntnisse und praktische Problemstellungen des Marketings an. - … sind vertraut mit der optimalen Gestaltung der Instrumente des Marketing-Mix im Hinblick auf den Konsumenten.

- … beurteilen Anwendungsfälle im Kaufverhalten und in der Unternehmenspraxis im Rahmen des Konsumentenverhalten. - … bewerten Erkenntnisse aus der Motivations-, Emotions-, Wahrnehmungs- und Sozialpsychologie im Marketingkontext.
Lehr- und Lernformen
Interaktiver Frontalunterricht
Anwesenheitspflicht
Prüfungsleistung (Prüfungsform, Umfang)
Schriftliche Klausur am Ende des Semesters, 60 min., 100 %
Gesamtnotenrelevanz
Wiederholungsmöglichkeit
Bei Nichtbestehen können alle Veranstaltungen gemäß § 6 der Fachstudien- und -prüfungsordnung wiederholt werden.
Literatur
• Koeber-Riel, W. Weinberg, P. / Gröppel-Klein, A. (2008): Konsumentenverhalten (9. Aufl.), München: Vahlen. • Homburg, Christian (2017). Marketingmanagement. Strategie, Instrumente, Umsetzung, Unternehmensführung. Wiesbaden, Springer-Gabler. • Hoyer, W.D./MacInnis, D.J. (2009): Consumer Behavior, International Edition (5 th ed.), Cengage Laerning Services. Trommsdorff, H. (2004): Konsumentenverhalten (6. Aufl.), Stuttgart.
Weitere Hinweise
Die Lehrveranstaltung soll durch Gastvorträge ergänzt werden.

34950 Decision Making Under Uncertainty

Module number
34950
Course name
Entscheidung unter Unsicherheit
Module coordinator
Prof Dr Marc Goerigk

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
271034	5	4
Availability	**Duration**	**Recommended semester**
Every summer semester	1 semester	any

Workload
Lecture classes 2 SWS (30h presence, 45h unsupervised work) Tutorial classes 2 SWS (30h presence, 45h unsupervised work)
Module applicability
Methoden
Reference to the LPO I
Recommended prerequisites
Mathematical maturity and previous work with optimization problems
Requirements
Module “Fundamentals of Management Science”
Language of instruction
English

Content
We study decision-making problems under uncertainty using optimization tools, including - robust optimization, in particular - min-max, min-max regret, and ordered weighted averaging - one- and two-stage problems - different types of uncertainty sets (discrete, polyhedral, budgeted, ellipsoidal) - complexity, approximation and solution methods - the application to combinatorial problems - stochastic optimization - other approaches, such as fuzzy sets
Intended learning outcomes (ILOs)
Upon completion of the module, students are able to - recognize and model uncertain data, taking into account resulting complexity consequences - apply suitable techniques to model and solve uncertainty in decision-making - differentiate between hard and easy uncertain problems
Teaching methods
- lecture with seminar character

- interactive lectures - group work in tutorial classes - online forums and discussions - take-home mock exam and its discussion - blended learning
Required attendance
Examination (type of examination, scope)
Oral exam (Duration 45 minutes), OR written exam (90 minutes) The type of exam will be communicated within the first two weeks of teaching.
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
Additional notes

34951 Combinatorial Optimization

Module number
34951
Course name
Kombinatorische Optimierung
Module coordinator
Prof Dr Marc Goerigk

Examination number	Credit points (ECTS)	Hours per week (SWS)
271036	5	4
Availability	**Duration**	**Recommended semester**
Every summer semester	1 semester	any

Workload
Lecture classes 2 SWS (30h presence, 45h unsupervised work) Tutorial classes 2 SWS (30h presence, 45h unsupervised work)
Module applicability
Reference to the LPO I
Recommended prerequisites
Mathematical maturity and previous work with optimization problems
Requirements
Language of instruction
English

Content
We study fundamentals of combinatorial decision making problems. These include - graph theory - complexity classes - approximation methods - spanning tree problems - path problems - matching problems - knapsack problems - traveling salesperson problems
Intended learning outcomes (ILOs)
Upon completion of the module, students are able to - identify fundamental problems of combinatorial optimization, also in the context of more complex decision-making situations - choose appropriate heuristic and exact solution methods and apply them to solve such problems - classify problems by their complexity, and demonstrate hardness using different proof techniques, including polynomial reductions

Teaching methods
- lecture with seminar character - interactive lectures - group work in tutorial classes - online forums and discussions - take-home mock exam and its discussion - blended learning
Required attendance
Examination (type of examination, scope)
Oral exam (Duration 45 minutes), OR written exam (90 minutes) The type of exam will be communicated within the first two weeks of teaching.
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
Related literature: Korte, B. H., Vygen, J. (2011). *Combinatorial optimization*. Berlin: Springer.
Additional notes

34953 Artificial Intelligence and Optimization

Module number
34953
Course name
Artificial Intelligence and Optimization
Module coordinator
Prof Dr Marc Goerigk

Examination number	Credit points (ECTS)	Hours per week (SWS)
	5	4
Availability	**Duration**	**Recommended semester**
Every winter semester	1 semester	

Workload
Lecture classes 2 SWS (30h presence, 45h unsupervised work) Tutorial classes 2 SWS (30h presence, 45h unsupervised work)
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
Basic knowledge of optimization and/or AI helpful
Requirements
Language of instruction
English

Content
We study the relationship between problems and methods in artificial intelligence (in particular, machine learning) and optimization. Concepts that are discussed include: - classification and regression trees - neural networks - nearest neighbors classification - support vector machines - clustering - robustness, interpretability, explainability Each aspect is discussed from both the AI and optimization perspective, including issues of complexity. Methods are tested computationally.
Intended learning outcomes (ILOs)
Upon completion of the module, students are able to - identify typical tasks in machine learning, - formulate them as optimization models, - distinguish between problems of different complexity classes, - identify and apply the most suitable optimization strategy, and - evaluate the quality of these methods

Teaching methods
- interactive lectures - group work in tutorial classes, including programming of AI and optimization methods
Required attendance
Examination (type of examination, scope)
Oral exam (Duration 45 minutes), OR written exam (90 minutes) The type of exam will be communicated within the first two weeks of teaching.
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
Related literature includes: - D. Bertsimas, J. Dunn: “Machine Learning under a Modern Optimization Lens”, Dynamic Ideas LLC, Belmont, Massachusetts, 2019 - M. Mohri, A. Rostamizadeh, A. Talwalkar: “Foundations of Machine Learning”, second edition, MIT Press, Cambridge, Massachusetts, 2018 - W. Ertel: “Grundkurs Künstliche Intelligenz”, fifth edition, Springer Vieweg, Wiesbaden, 2021
Additional notes

34954 Network Optimization

Module number
34954
Course name
Network Optimization
Module coordinator
Prof Dr Marc Goerigk

Examination number	Credit points (ECTS)	Hours per week (SWS)
	5	4
Availability	**Duration**	**Recommended semester**
irregular	1 semester	

Workload
Lecture classes 2 SWS (30h presence, 45h unsupervised work) Tutorial classes 2 SWS (30h presence, 45h unsupervised work)
Module applicability
Methoden
Reference to the LPO I
Recommended prerequisites
Basic knowledge of combinatorial optimization or linear programming is helpful
Requirements
Language of instruction
English

Content
We study optimization problems on graphs. We develop an understanding of different problem types and discuss corresponding solution methods. Problem applications include: - shortest path problems - minimum spanning tree problems - maximum flow problems - minimum cost flow problems - assignments and matchings - multicommodity flow problems
Intended learning outcomes (ILOs)
Upon completion of the module, students are able to - identify network optimization problems, - differentiate between polynomially solvable and hard types of problems, - choose and apply an appropriate solution method, - assess the impact of using different data structures for the implementation of algorithms, and - model real-world problems using networks.

Teaching methods
- interactive lectures - group work in tutorial classes
Required attendance
Examination (type of examination, scope)
Oral exam (Duration 45 minutes), OR written exam (90 minutes) The type of exam will be communicated within the first two weeks of teaching.
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
Recommended literature includes: - R. K. Ahuja, T. L. Magnanti, J. B. Orlin: “Network Flows – Theory, Algorithms, and Applications”, Pearson, Harlow, 2014
Additional notes

34955 Heuristics and Approximation Methods

Module number
34955
Course name
Heuristics and Approximation Methods
Module coordinator
Prof Dr Marc Goerigk

Examination number	Credit points (ECTS)	Hours per week (SWS)
	5	4
Availability	**Duration**	**Recommended semester**
irregular	1 semester	

Workload
Lecture classes 2 SWS (30h presence, 45h unsupervised work) Tutorial classes 2 SWS (30h presence, 45h unsupervised work)
Module applicability
Methoden
Reference to the LPO I
Recommended prerequisites
Basic knowledge of combinatorial optimization is helpful
Requirements
Language of instruction
English

Content
We discuss optimization algorithms for problems that are too difficult to solve exactly. They either provide no guarantee (heuristics in general) or do provide a guarantee (approximation methods) on the quality of the resulting solution. Types of methods we study include - greedy algorithms - local search - meta-heuristics and matheuristics - dynamic programming - deterministic and randomized rounding - primal-dual methods - approximation schemes
Intended learning outcomes (ILOs)
Upon completion of the module, students are able to - differentiate between approximable and inapproximable problems, - apply techniques to analyze the approximation guarantee of solution methods, - develop effective heuristic strategies for complex economical problems, and - find solutions of good quality for difficult decision problems

Teaching methods
- interactive lectures - group work in tutorial classes
Required attendance
Examination (type of examination, scope)
Oral exam (Duration 45 minutes), OR written exam (90 minutes) The type of exam will be communicated within the first two weeks of teaching.
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
Recommended literature includes: - D. P. Williamson, D.B. Shmoys: “The Design of Approximation Algorithms”, Cambridge University Press, New York, 2011
Additional notes

34956 Masterseminar in Business Analytics

Modulnummer
34956
Veranstaltungstitel
Masterseminar
Modulverantwortliche*r / Prüfer*innen
Prof. Dr. Marc Goerigk

Prüfungsnummer	ECTS	SWS
	7	2
Modulangebot	**Zeitdauer des Moduls**	**Empfohlenes Studiensemester**
jedes Semester	1 Semester	2.-4.

Workload
Seminar 2 SWS (30h Präsenzzeit, 180h Eigenarbeitszeit)
Verwendbarkeit
Wirtschaftsinformatik/ Information Systems
Bezug zur LPO I
Empfohlene Voraussetzungen
Teilnahme an mindestens einer dieser Veranstaltungen hilfreich: Decision Making Under Uncertainty, Combinatorial Optimization, Artificial Intelligence and Optimization, Network Optimization, Heuristics and Approximation Methods
Verpflichtende Voraussetzungen
Unterrichtssprache
Deutsch und Englisch

Inhalt
Es werden aktuelle Themen aus dem Forschungsbereich Business Analytics behandelt und von den Studierenden eigenständig bearbeitet, schriftlich dokumentiert und analysiert sowie vorgestellt.
Lernergebnisse Lernziele
Studierende erlernen die Fähigkeiten: - an einem ausgewählten, vertiefenden und aktuellen Thema in Business Analytics selbstständig und methodisch wissenschaftlich zu arbeiten - durch modulübergreifend gestellte Seminarthemen sich kritisch fachlich mit aktuellen Themenstellungen auseinander zu setzen - wissenschaftliche Methoden der empirischen Forschung bzw. Methoden der Lösung von praxisorientierten Problemstellungen anzuwenden Sie erwerben darüber hinaus kommunikative Kompetenz und fachbezogene Methodenkompetenz
Lehr- und Lernformen
Selbständige Textarbeite, Präsentationen, Gruppendiskussionen
Anwesenheitspflicht

Prüfungsleistung (Prüfungsform, Umfang, Gewichtung)
Vortrag (30 Minuten, 50%) und Hausarbeit (20 Seiten, 50%)
Gesamtnotenrelevanz
Wiederholungsmöglichkeit
Bei Nichtbestehen können alle Veranstaltungen gemäß § 6 der Fachstudien- und -prüfungsordnung wiederholt werden.
Weitere Hinweise

35002 Business Intelligence & Analytics Systems

Module number
35002
Course name
Business Intelligence & Analytics Systems
Module coordinator
Prof. Dr. Ulrich Gnewuch

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
283020	5	4
Availability	**Duration**	**Recommended semester**
Every summer semester	1 semester	

Workload
Lecture 2 SWS (30 h attendance and 45 h self-study) Exercise 2 SWS (30 h attendance and 45 h self-study) Calculation basis: 15 weeks in a semester, including an examination week; each SWS corresponds to 60 minutes.
Module applicability
Wirtschaftsinformatik / Information Systems
Reference to the LPO I
Recommended prerequisites
According to § 3 of the study and examination regulations for the master's degree program in Information Systems. Basic skills in data analysis and/or programming (e.g., Python, R) are recommended.
Requirements
Language of instruction
English

Content
With the exponential growth of data and technological advancements in analytics, organizations have recognized the value of using data to drive their business decisions. In order to enable employees across all facets of the business to become more data-driven in their decision-making, organizations employ a variety of business intelligence & analytics (BI&A) systems. Examples include BI&A systems for data provisioning (e.g., data warehouses), information generation (e.g., process mining platforms), and information presentation and distribution (e.g., dashboards). This course focuses on the fundamental concepts and core components of BI&A systems as well as their role in data-driven decision-making within organizations. It is not a technical course, but rather takes a managerial perspective on the design, use, and impact of BI&A systems. In the exercise, students will work on real-world BI&A case studies and get hands-on experience with state-of-the-art BI&A tools.

Intended learning outcomes (ILOs)
After successful participation in this course, students will be able to: - Explain what business intelligence & analytics (BI&A) systems are and how they enable data-driven decision-making in organizations - Differentiate between BI&A systems for data provisioning, information generation, and information presentation and distribution - Explain the theoretical and conceptual foundations guiding the design, implementation, and management of BI&A systems - Identify key challenges with different types of BI&A systems and develop strategies for addressing these challenges In addition, students will gain hands-on experience with state-of-the-art BI&A tools.
Teaching methods
- Interactive lectures and classroom discussions - Exercises, case studies, and student presentations - Readings and pre-recorded videos
Required attendance
Examination (type of examination, scope)
Portfolio: Group work and presentations during the course (40%); final exam (60%)
Overall grade relevance
Exam resit opportunities
According to the study and examination regulations for the master's degree program in Information Systems / Annually.
Recommended reading
Chen, H., Chiang, R. H. L., & Storey, V. C. (2012). Business intelligence and analytics: From big data to big impact. MIS Quarterly, 36(4), 1165–1188. Sharda, R., Delen, D., & Turban, E. (2014). Business intelligence and analytics: systems for decision support. 10th edition. Pearson.
Additional notes
All teaching material in English language. Teaching language is English.

35005 Masterseminar AI-Based Information Systems

Module number
35005
Course name
Masterseminar AI-Based Information Systems
Module coordinator
Prof. Dr. Ulrich Gnewuch

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
262694	7	2
Availability	**Duration**	**Recommended semester**
Summer and/or winter semester	1 semester	The module should be taken close to the end of the master's program as preparation for the master thesis.

Workload
Seminar 2 SWS (30 h attendance and 180 h own work). Calculation basis: 15 weeks in a semester, including an examination week; each SWS corresponds to 60 minutes.
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
According to the study and examination regulations for the respective degree program. Good English skills are required. Participants are expected to write their seminar paper and deliver their presentation in English.
Requirements
Language of instruction
English

Content
In this seminar, we examine and discuss current topics in the field of information systems that are situated within the research focus areas of the chair. The theme of the seminar varies and is announced in advance. The seminar involves the review of scientific literature on a selected topic. Participants will document their method and results in a written seminar paper and present their findings to other seminar participants at the end of the semester.
Intended learning outcomes (ILOs)
After successful participation in this seminar, students will be able to: - describe the principles of good scientific practice and key guidelines for academic writing - identify, review, and analyze scientific literature on a specific topic - write a scientific paper based on the reviewed literature - present the main results of their scientific work effectively

- provide constructive and respectful feedback on others' work
Teaching methods
Seminar meetings, interactive presentations, and discussions Advice and feedback on the seminar paper and the final presentation
Required attendance
Examination (type of examination, scope)
Portfolio: Seminar paper (70%); presentation and discussion (30%).
Overall grade relevance
Exam resit opportunities
Recommended reading
Core literature depends on the theme of the seminar and will be communicated beforehand. Participants are expected to read additional literature on their specific topic.
Additional notes
The course language is English. The number of participants is limited. Prior application for this course is necessary. Information on the application process are provided on the chair's website.

35006 Artificial Intelligence (AI)-Based Business Information Systems

Module number
35006
Course name
Artificial Intelligence (AI)-Based Business Information Systems
Module coordinator
Prof. Dr. Ulrich Gnewuch

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
482608	5	4
Availability	**Duration**	**Recommended semester**
Every winter semester	1 semester	

Workload
Lecture 2 SWS (30 h attendance and 45 h self-study) Exercise 2 SWS (30 h attendance and 45 h self-study) Calculation basis: 15 weeks in a semester, including an examination week; each SWS corresponds to 60 minutes.
Module applicability
Wirtschaftsinformatik / Information Systems
Reference to the LPO I
Recommended prerequisites
According to § 3 of the study and examination regulations for the master's degree program in Information Systems. Basic skills in data analysis and/or programming (e.g., Python, R) are highly recommended.
Requirements
Language of instruction
English

Content
Artificial intelligence (AI) offers significant opportunities while also creating new challenges for businesses. In light of these dynamics, this course focuses on the design, management, use, and impact of AI-based business information systems. It is not a technical course, but rather takes a managerial/organizational perspective on the use of AI in businesses. Topics covered will include: - Theoretical and conceptual foundations of AI-based business information systems - Business capabilities enabled by AI-based information systems: automation, engagement, insights & decisions, and innovation - Challenges in and strategies for designing and managing AI-based information systems - Exercises and case studies on selected AI-based information systems (e.g., robotic process automation, conversational AI, explainable AI, generative AI)

Intended learning outcomes (ILOs)
After successful participation in this course, students will be able to: - Explain what AI-based business information systems are and how they enable important business capabilities - Describe the theoretical and conceptual foundations that guide the design and management of different AI-based business information systems - Identify key challenges in designing and managing different types of AI-based business information systems and develop strategies for addressing these challenges In addition, students will gain some hands-on experience with explainable AI techniques and human-centered design approaches.
Teaching methods
- Interactive lectures and classroom discussions - Exercises, case studies, and student presentations - Readings and pre-recorded videos
Required attendance
Examination (type of examination, scope)
Portfolio: Group work and presentations during the course (40%); final exam (60%)
Overall grade relevance
Exam resit opportunities
According to the study and examination regulations for the master's degree program in Information Systems / Annually.
Recommended reading
Benbya, H., Pachidi, S., & Jarvenpaa, S. (2021). Artificial intelligence in organizations: Implications for information systems research. *Journal of the Association for Information Systems*, 22(2), 281-303. Berente, N., Gu, B., Recker, J., & Santhanam, R. (2021). Managing artificial intelligence. *MIS Quarterly*, 45(3), 1433-1450. Shneiderman, B. (2022). Human-centered AI. Oxford University Press.
Additional notes
All teaching material in English language. Teaching language is English. Replaces the course "Design and Management of AI-Based Business Information Systems": Students who have already completed the course "Design and Management of AI-Based Business Information Systems" (35000) cannot register for this course.

35010 Master Colloquium: AI-Based Information Systems

Module number
35010
Course name
Master Colloquium: AI-Based Information Systems
Module coordinator
Prof. Dr. Ulrich Gnewuch

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
283012	1	1
Availability	**Duration**	**Recommended semester**
Every semester	1 semester	While working on the master thesis

Workload
Colloquium 1 SWS (15 h attendance and 15 h self-study) Calculation basis: 15 weeks in a semester, including an examination week; each SWS corresponds to 60 minutes.
Module applicability
Wirtschaftsinformatik / Information Systems
Reference to the LPO I
Recommended prerequisites
According to the study and examination regulations for the respective degree program.
Requirements
Admission to write a master thesis at the chair is a requirement for participating in the colloquium.
Language of instruction
English

Content
The colloquium introduces students to the foundations of scientific research and equips them with essential skills for writing a master thesis. Additionally, it provides an opportunity for students to present their thesis project and receive feedback from both their peers and members of the chair.
Intended learning outcomes (ILOs)
After participating in the colloquium, students will be able to: - Describe the principles of good scientific practice and key guidelines for academic writing - Present and explain their own scientific work effectively - Handle and implement critical feedback - Provide constructive and respectful feedback on others' work
Teaching methods
- Interactive sessions with student presentations and classroom discussions - Readings and self-study videos

Required attendance
Yes
Examination (type of examination, scope)
Presentation
Overall grade relevance
Exam resit opportunities
According to the study and examination regulations for the respective degree program.
Recommended reading
Additional notes
Participation is mandatory for all students who are writing their master thesis at the chair. Admission to write a master thesis at the chair is a requirement for participating in the colloquium. Further information on the thesis process is provided on the chair’s website.

35500 Multivariate Verfahren

Modulnummer
MRIEB20232-XX-M16
Modultitel
35500 Multivariate Verfahren
Modulverantwortliche*r / Prüfer*innen
Prof. Dr. Joachim Schnurbus

Prüfungsnummer	**ECTS**	**SWS**
201504	5	4
Modulangebot	**Zeitdauer des Moduls**	**Empfohlenes Studiensemester**
Wintersemester	1 Semester	1

Workload
4 SWS, davon ca. 3 SWS Vorlesung, ca. 1 SWS Übung. Dies entspricht 57 St. Präsenzzeit und 93 St. Eigenarbeitszeit. Es wird mit 15 Semesterwochen gerechnet (14 Vorlesungs- + 1 Prüfungswoche) und jede SWS geht mit 60 Minuten in die Berechnung ein.
Verwendbarkeit
Methoden
Bezug zur LPO I
Empfohlene Voraussetzungen
Grundlegende Mathematik- und Statistik-Kenntnisse.
Verpflichtende Voraussetzungen
Unterrichtssprache
Deutsch

Inhalte
Multivariate Verfahren sind ein wichtiger Bestandteil in der empirischen Forschungspraxis, unter anderem im Bereich der Marktforschung. In diesem Modul werden grundlegende Analysetechniken für multivariate Datenstrukturen sowie deren theoretische Fundierung behandelt. Neben einer Einführung in die Grundlagen multivariater Analysemethoden umfasst das Modul folgende Themengebiete: • Hauptkomponentenanalyse • Regressionsanalyse • Faktorenanalyse • Varianzanalyse • Diskriminanzanalyse • Clusteranalyse
Lernergebnisse Lernziele
Studierende, die erfolgreich an dem Modul teilgenommen haben:

• sind in der Lage, Fragestellungen, Anwendungsfelder und Potenziale von multivariaten statistischen Verfahren zu erkennen. Sie verstehen die grundlegenden strukturentdeckenden Verfahren (wie Clusteranalyse) und grundlegenden strukturprüfenden Verfahren (wie Regressionsanalyse) und deren Annahmen. • können die Verfahren anwenden und kombinieren, sowie Modellschätzungen und Hypothesentests durchführen und analysieren. • können Berechnungen, die mit der Statistiksoftware R erzeugt wurden, reproduzieren und den zugehörigen R-Code interpretieren. • sind in der Lage, empirische Ergebnisse kritisch zu bewerten und weiterführende Literatur zu den Verfahren zu verstehen und zu diskutieren.
Lehr- und Lernformen
Interaktiver Frontalunterricht und Diskussion von Lehrinhalten. Vermittlung der theoretischen Grundlagen und Illustration anhand von Beispielen in der Vorlesung und Übung. Berechnen und besprechen von Übungsaufgaben. Anwenden der Statistiksoftware R (R-Vorkenntnisse werden nicht vorausgesetzt). Barrierefreie Vorlesungs- und Übungsmaterialien, Pflichtliteratur sowie Software sind ab Kursstart verfügbar.
Anwesenheitspflicht
Prüfungsleistung (Prüfungsform, Umfang)
Klausur oder häusliche Leistungsfeststellung (60 Min.), oder mündliche (Online-)Prüfung.
Gesamtnotenrelevanz
100 %
Wiederholungsmöglichkeit
Literatur
• Handl, A. & T. Kuhlenkasper (2017), Multivariate Analysemethoden, Springer. • Johnson, R.A. & D.W. Wichern (2007), Applied Multivariate Statistical Analysis, Pearson Prentice Hall. • Ligges, U. (2008), Programmieren mit R, Springer. • Kleiber, C. & A. Zeileis (2008), Applied Econometrics with R, Springer.
Weitere Hinweise

35550 Topics in Applied Econometrics

Module number
35550 and 35551
Module title
35550 Topics in Applied Econometrics (lecture) & 35551 ~ (Tutorial)
Module coordinator
Prof. Dr. Harry Haupt, Prof. Dr. Joachim Schnurbus

Examination number	Credit points (ECTS)	Hours per week (SWS)
271030	5	2+2
Availability	**Duration**	**Recommended semester**
Usually every summer term	1 semester	2/4

Workload
Lecture 2 SWS (28 h Contact hours and 28 h Self-study) and Tutorial 2 SWS (28 h Contact hours, 28 h Self-study). We are calculating with 15 semester weeks (Lecture, Tutorial and Exam). Each SWS is included in the calculation with 60 minutes.
Module applicability
Methoden
Reference to the LPO I
Recommended prerequisites
An understanding of introductory statistics including inferential methods and regression analysis and test methods on bachelor level. Basic knowledge of R statistical software is an advantage.
Requirements
Language of instruction
English

Content
This module covers a selection (usually divided in three to four blocks) of fundamental research methods and techniques in applied econometrics. Topics included are: Maximum-Likelihood estimation and inference (for specification tests and various fields of microeconometric applications), advanced applications of least squares and GMM (for modeling heterogeneity and endogeneity in empirical practice), smoothing methods such as kernel and spline regression, robust inferential methods such as quantile regression and their interpretation, machine learning methods (and their applications in econometrics), and simulation-based methods (such as Bootstrap-, Monte Carlo-, and Bayesian techniques).
Intended learning outcomes (ILOs)
Students who have successfully completed the module: • develop a basic understanding of some of the core methods of applied econometrics. • are able to reflect the underlying elementary mathematical foundations and corresponding assumptions of estimation and inference for the covered techniques, while developing an awareness of potential pitfalls in empirical practice.

• can implement the methods in the statistical software R, apply the methods to empirical datasets and are able to provide economic interpretations and critically reflect the modeling results.
Teaching methods
Interactive frontal teaching and discussion of the course content. Teaching of theoretical principles and illustration by examples in lecture and tutorial. Weekly (accessible) lecture and exercise materials and required literature. Some of the tutorials are hands-on using the open-source statistical software R. Students are explicitly invited to play an active role in lectures and tutorials through questions and input for discussions. Additionally, students are invited to indicate those parts of the course for which they need additional training. Readings are essential to prepare the class and the exam.
Required attendance
Examination (type of examination, scope)
Portfolio, consisting of two parts: • Part 1 (1/3): Short presentation of (a part of) a scientific paper or an application. • Part 2 (2/3): Oral (online) exam or performance assessment at home.
Overall grade relevance
One overall grade, 100%
Exam resit opportunities
Recommended reading
Among others and depending on the selection of topics: Angrist, J.D. & Pischke J.-S. (2009); Mostly Harmless Econometrics, Princeton. Cameron, C.A. & Trivedi, P.K. (2005), Microeconometrics: Methods & Applications, Cambridge. Franses, P.H., van Dijk, D. & A. Opschoor (2014), Time Series Models for Business and Economic Forecasting, Cambridge. Kleiber, C. & Zeileis, A. (2008), Applied Econometrics with R, Springer. Verbeek, M.. (2017), A Guide to Modern Econometrics, 5e, Wiley
Additional notes

35610 Paneldatenanalyse

Modulnummer
Veranstaltungstitel
35610 Paneldatenanalyse (VL) und 35611 Paneldatenanalyse (Ü)
Modulverantwortliche*r / Prüfer*innen
Prof. Dr. Harry Haupt, Dr. Markus Fritsch

Prüfungsnummer	**ECTS**	**SWS**
261080	5	2+2
Modulangebot	**Zeitdauer des Moduls**	**Empfohlenes Studiensemester**
Jedes Sommersemester	1 Semester	2

Workload
Vorlesung 2 SWS (30 St. Präsenzzeit und 45 St. Eigenarbeitszeit) und Übung 2 SWS (30 St. Präsenzzeit und 45 St. Eigenarbeitszeit). Es wird mit 15 Semesterwochen gerechnet (Vorlesung, Übung und Prüfung) und jede SWS geht mit 60 Minuten in die Berechnung ein.
Verwendbarkeit
Methoden
Bezug zur LPO I
Empfohlene Voraussetzungen
Kenntnis der Inhalte von „Econometric Methods“. Dies umfasst eine detaillierte Kenntnis des multiplen linearen Regressionsmodells für Querschnittsdaten (OLS-Schätzung, Tests sowie entsprechende zugrundeliegende Annahmen, Projektionsmatrizen) sowie solide Kenntnisse im Umgang mit der Statistiksoftware R. Kenntnisse von Modellen für Zeitreihendaten sind hilfreich, werden jedoch nicht vorausgesetzt.
Verpflichtende Voraussetzungen
keine
Unterrichtssprache
Deutsch

Inhalte
Zentraler Gegenstand des Moduls ist die Schätzung von Regressionsmodellen für Paneldaten. Hierbei werden neben grundlegenden Schätzverfahren und Fehlerkomponentenmodellen unter anderem die Fixed-Effects- und Random-Effects-Schätzung behandelt. Weitere Kursinhalte sind dynamische Paneldatenmodelle sowie Test- und Prognoseverfahren für Paneldaten (Stichwort: Best linear unbiased prediction). Die Vermittlung der Kursinhalte erfolgt in Form von Modelltheorie und Anwendung sowie mittels Besprechung und Diskussion ausgewählter Literatur. Die Inhalte werden auch anhand von Beispielen in der Statistiksoftware R veranschaulicht.
Lernergebnisse Lernziele
Nach erfolgreicher Teilnahme am Modul sind die Studierenden in der Lage: • Fragestellungen, Anwendungsfelder und Potenziale von Panelmodellschätzungen zu erkennen.

- die zentralen Annahmen für statische und dynamische Panelmodellschätzer erläutern und kritisch reflektieren.
- geeignete Schätzverfahren für Paneldaten auf Basis der zugrundeliegenden Modelltheorie auszuwählen.
- statische und dynamische Panelmodellschätzungen in der Statistiksoftware R implementieren und die Schätzergebnisse interpretieren zu können.
- Hypothesen- und Modellspezifikationstests für Panelmodellschätzer anzuwenden und deren Ergebnisse einzuordnen und kritisch zu reflektieren.
- aktuelle Literatur zu lesen, zu verstehen und zu diskutieren.

Lehr- und Lernformen

Interaktiver Frontalunterricht und Diskussion von Lehrinhalten. Vermittlung der theoretischen Grundlagen und Illustration anhand von Beispielen in der Vorlesung und Übung. Die Theorie wird auch durch Beispiele in der Statistiksoftware R veranschaulicht. Wöchentliche Vorlesungs- und Übungsmaterialien sowie Pflichtliteratur.

Anwesenheitspflicht

Prüfungsleistung (Prüfungsform, Umfang)

Schriftliche Prüfung oder häusliche Leistungsfeststellung (60 Minuten)
oder mündliche (Online-)Prüfung

Gesamtnotenrelevanz

100%

Wiederholungsmöglichkeit

Literatur

Basisliteratur (andere Auflagen dieser Bücher sind ebenfalls verwendbar):
- Wooldridge, J.M. (2019), Introductory Econometrics, 7A, Thomson South-Western.
- Stock, J.H. und M.W. Watson (2019), Introduction to Econometrics, 4A, Pearson.
- Greene, W.H. (2019), Econometric Analysis, 8A., Pearson.

Weiterführende Literatur:
- Baltagi, B.H. (2021), Econometric Analysis of Panel Data, 6A., Wiley.
- Wooldridge, J. (2010), Econometric Analysis of Cross Section and Panel Data, 2A, MIT Press.
- Arellano, M. (2004), Panel Data Econometrics, Oxford University Press.
- Angrist, J.D. und J.-S. Pischke (2009), Mostly Harmless Econometrics, Princeton University Press.

Weitere Hinweise

Die Theorie wird auch anhand von Beispielen in der Statistiksoftware R illustriert.

35621 Computational Statistics – Regression in R

Module number
35621
Course name
Computational Statistics – Regression in R
Module coordinator
Prof. Dr. Joachim Schnurbus

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
261070	3	2
Availability	**Duration**	**Recommended semester**
Every winter semester; if possible every semester	1 semester (or block course)	1

Workload
Computer lectures and exercises: 30 hrs. attendance and 60 hrs. self-study The calculation is based on 15 semester weeks (14 lectures + 1 examination week) and each SWS is included in the calculation with 60 minutes.
Module applicability
Methoden Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
The course aims at students with a basic knowledge in statistics and complements some of the topics treated in ‘Econometric Methods'.
Requirements
Language of instruction
English

Content
The course focuses on estimating and evaluating regression models with the statistical software R. Model evaluation procedures discussed in class range from graphical methods, classic validation techniques and tests to simulation-based approaches. The course includes model selection (i.e., finding the best model from a large number of possible models), model validation (i.e., checking whether the presumed best specification satisfies the model assumptions), and model interpretation (for linearly and/or nonlinearly transformed variables). Additionally, different data structures such as cross-sections, time series, and panel data are shortly discussed.
Intended learning outcomes (ILOs)
Students who have successfully passed the module: • are able to perform and interpret a regression analysis in the statistical software R. • have the skill to select an appropriate statistical model, critically judge the validity of a model and in detail interpret the estimation results in order to provide decision support.

• are able to create Monte Carlo-simulations in order to perform a simulation-based assessment of statistical methods or models. • understand statistical tests and can select, apply, and interpret the appropriate tests in regression context.
Teaching methods
Interactive frontal teaching and discussion of the R-Codes. Exercises that are worked on independently in R and then discussed together. Students are expected to deepen their knowledge by completing self-contained R-exercises. Accessible lecture and exercise materials and required literature.
Required attendance
Examination (type of examination, scope)
Exam or performance assessment at home (60 minutes) or portfolio. R-skills are certified via a certificate when the exam is passed.
Overall grade relevance
100%
Exam resit opportunities
Recommended reading
- Kleiber, C. & A. Zeileis (2008), Applied Econometrics with R, Springer. - Field, A. & Miles, J. & Field, Z. (2012), Discovering Statistics using R, SAGE. - Wooldridge, J. (2013), Introductory Econometrics, 5Ed., South Western. - Greene, W.H. (2012), Econometric Analysis, Pearson. - Ligges, U. (2008), Programmieren mit R, Springer.
Additional notes

35622 Computational Statistics – Statistical Learning in R

Module number
35622
Module title
Computational Statistics - Statistical Learning in R
Module coordinator
Prof. Dr. Joachim Schnurbus

Examination number	Credit points (ECTS)	Hours per week (SWS)
261001	3	2
Availability	**Duration**	**Recommended semester**
Every summer semester, if possible every term.	1 semester (or block course)	2

Workload
Computer lectures and exercises: 30 hrs. attendance and 60 hrs. self-study The calculation is based on 15 semester weeks (14 lectures + 1 examination week) and each SWS is included in the calculation with 60 minutes.
Module applicability
Methoden Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
The course aims at students with a basic knowledge in statistics (especially regression methods) and basic knowledge of R (e.g. via 'Computational Statistics – Regression in R').
Requirements
Language of instruction
English

Content
Statistical Learning sums up methods from computational statistics that are designed to deal with high dimensional, complex large-scale data sets. Various topics that facilitate modeling of and gaining a deeper insight into these data sets are introduced. Supervised (classification and regression) and unsupervised statistical learning techniques (like neural nets, boosting, clustering) are presented, discussed, and applied. Further topics comprise preprocessing (transformation of variables), resampling (cross-validation, bootstrapping), meta-parameter selection, model evaluation.
Intended learning outcomes (ILOs)
Students who have successfully passed the module: • are able to apply and interpret unsupervised and supervised learning methods in the statistical software R. • have the skill to select a problem-adequate statistical learning method, to configure and employ the corresponding R-functions, to critically judge the validity of the outcomes, and to interpret the results in order to provide decision support.

• will be able to relate to recent literature on statistical learning.
Teaching methods
Interactive frontal teaching and discussion of the R-Codes. Exercises that are worked on independently in R and then discussed together. Students are expected to deepen their knowledge by completing self-contained R-exercises. Accessible lecture and exercise materials and required literature.
Required attendance
Examination (type of examination, scope)
Exam or performance assessment at home (60 minutes) or portfolio. R-skills are certified via a certificate when the exam is passed.
Overall grade relevance
100%
Exam resit opportunities
Recommended reading
- Kuhn, M. & Johnson, K. (2013), Applied Predictive Modeling, Springer. - Hastie, T., Tibshirani, R. & Friedman, J. (2009), The Elements of Statistical Learning: Data Mining, Inference, and Prediction, 2Ed., Springer. - Efron, B., Hastie, T. (2016), Computer Age Statistical Inference, Cambridge University Press. - Torgo, L. (2017), Data Mining with R: Learning with Case Studies, 2Ed., CRC Press. - James, G., Witten, D., Hastie, T & Tibshirani, R. (2015), An Introduction to Statistical Learning: with Applications in R, Springer.
Additional notes

35777 Econometric Methods

Module number
35777 and 35778 (Tutorial)
Module title
35777 Econometric Methods (Lecture) and 35778 Econometric Methods (Tutorial)
Module coordinator
Prof. Dr. Harry Haupt

Examination number	Credit points (ECTS)	Hours per week (SWS)
261120	5	3+2
Availability	**Duration**	**Recommended semester**
Every winter semester	1 semester	1

Workload
Lecture 3 SWS (42 h Contact hours and 28 h Self-study) and Tutorial 2 SWS (28 h Contact hours, 42 h Self-study). We are calculating with 15 semester weeks (Lecture, Tutorial and Exam). Each SWS is included in the calculation with 60 minutes.
Module applicability
Methoden
Reference to the LPO I
Recommended prerequisites
Bachelor's level understanding of calculus and matrix algebra, introductory statistics including inferential methods, regression analysis, and testing methods. Basic knowledge of R statistical software is an advantage.
Requirements
none
Language of instruction
English

Content
This module provides an introduction into the core methods of modern econometrics at international standard master's level. The following content is covered: Regression analysis and estimation principles, econometric models, hypothesis testing in regression, exact and asymptotic inference, endogeneity, and heteroscedasticity.
Intended learning outcomes (ILOs)
Students who have successfully completed the module are able: • to give a systematic overview of the core principles of modern econometrics. • to understand regression estimation and inference methods and their basic interpretations • to apply the acquired methods and principles to data-based problems. • to perform econometric analyses and will know the underlying mathematical assumptions and the corresponding statistical properties of important regression-based testing and estimation procedures. • to critically assess empirical results, identify potential pitfalls, falsify statements while quantifying the underlying uncertainty, and develop and interpret sound simple models.

Teaching methods
Interactive frontal teaching and discussion of the course content. Teaching of theoretical principles and illustration by examples in lecture and tutorial. Weekly (accessible) lecture and exercise materials and required literature. Some of the tutorials are hands-on using the open-source statistical software R.
Required attendance
Examination (type of examination, scope)
Written exam or home performance assessment (60 minutes) or oral (online) exam
Overall grade relevance
100%
Exam resit opportunities
Recommended reading
- Hansen, B. (2021), Econometrics. http://www.ssc.wisc.edu/~bhansen/econometrics/ - Davidson, R. & J.G. MacKinnon (2009), Econometric Theory and Methods, Oxford Univ. Press. - Stock J.H. & M.M.Watson (2019) Introduction to Econometrics. 4e. Pearson. - Angrist J.D. & J.S. Pischke (2009) Mostly Harmless Econometrics. Princeton Univ. Press.
Additional notes

35780 Advanced Data Analytics

Module number
35780 and 35781 (Tutorial)
Course name
Advanced Data Analytics
Module coordinator
Prof. Dr. Harry Haupt, Dr. Markus Fritsch

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
261004	5	2+2
Availability	**Duration**	**Recommended semester**
Usually every winter semester	1 semester	3

Workload
Lecture 2 SWS (30 h Contact hours and 45 h Self-study) and Tutorial 2 SWS (30 h Contact hours, 45 h Self-study). We are calculating with 15 semester weeks (Lecture, Tutorial, and Exam). Each SWS is included in the calculation with 60 minutes.
Module applicability
Methoden
Reference to the LPO I
Recommended prerequisites
Basic understanding of calculus and matrix algebra, introductory statistics including inferential methods, regression analysis, and testing methods. Basic knowledge of statistical software R is an advantage.
Requirements
Language of instruction
English

Content
This module covers key state of the art techniques in statistical learning/machine learning. The emphasis of the course is on techniques from supervised learning in the context of regression modeling. The following content is covered: Fundamental concepts (bias-variance trade-off, curse of dimensionality, flexibility vs. interpretability, resampling techniques), key building blocks (parametric polynomials, spline-regression, tree-based modeling), and frequently employed algorithms (lasso, backfitting, random forest, boosting). Prediction and inference are discussed. Selected applications are used to motivate the different algorithms.
Intended learning outcomes (ILOs)
Students who have successfully completed the module are able to: • explain and reflect the main principles and key assumptions of the covered techniques. • choose suitable and problem-adequate modeling approaches in the context of supervised learning. • implement the approaches in the statistical software R. • develop and evaluate predictive models for particular applications.

• interpret and critically assess the modeling results. • discuss selected considerations regarding inference for predictive models and implement the approaches.
Teaching methods
Interactive frontal teaching and discussion of the course content. Teaching of theoretical principles and illustration by examples in lecture and tutorial. Weekly (accessible) lecture and exercise materials and required literature. Some of the tutorials are hands-on using the open-source statistical software R. Students are explicitly invited to play an active role in lectures and tutorials through questions and input for discussions. Readings are essential to prepare the class and the exam.
Required attendance
Examination (type of examination, scope)
Written exam or performance assessment at home (60 minutes) or oral (online) exam
Overall grade relevance
100%
Exam resit opportunities
Recommended reading
Hastie, T., R. Tibshirani, R., and J. Friedman (2017), The Elements of Statistical Learning, 2A, Springer. James, G., Witten, D., Hastie, T., and R. Tibshirani (2023), An Introduction to Statistical Learning, 2A, Springer. Kuhn, M. and K. Johnson (2013), Applied Predictive Modeling, Springer. Efron, B. and T. Hastie (2016), Computer Age Statistical Inference: Algorithms, Evidence, and Data Science, Cambridge University Press.
Additional notes

37500 Strategic IT Management

Module number
37500
Course name
Strategic IT Management
Module coordinator
Prof. Dr. Thomas Widjaja

Examination number	Credit points (ECTS)	Hours per week (SWS)
283003	5	4
Availability	**Duration**	**Recommended semester**
Every winter semester	1 semester	

Workload
Lecture 2 SWS (30 hours class attendance; 45 hours self-study) Exercise 2 SWS (30 hours class attendance; 45 hours self-study) Calculation is based on: every hr./sem.-week corresponds to 60 minutes. One semester is presumed to be 15 weeks, i.e. 14 course + 1 exam week
Module applicability
Information Systems
Reference to the LPO I
Recommended prerequisites
According to § 3 of the study and examination regulations for the Master's degree program in Information Systems. Successful attendance of the module "IT Management" (or comparable knowledge requirement) is recommended.
Requirements
Language of instruction
English

Content
This module provides conceptual and analytical skills for designing, managing, and implementing information technology and information systems for organizations. The course provides an overview of the main tasks and goals of strategic IT management. In addition, selected current challenges of IT management will be discussed. Among others, the following topics will be addressed: 1. Value of IT 2. IT governance 3. IT outsourcing 4. Management of IT architectures 6. Standardization of IT 7. IT integration 8. Business intelligence and big data 9. Data-driven business models

Intended learning outcomes (ILOs)
Students who have successfully participated in the module are able to • describe and explain the value contribution of IT. • discuss the advantages and disadvantages of different IT governance archetypes. • evaluate the economic benefits of IT outsourcing. • describe the tasks of business intelligence. • explain the goals of IT architecture management. • perform selected methods of IT architecture management. • evaluate the advantages and disadvantages of IT standardization. • explain the key characteristics of data-driven business models.
Teaching methods
• Interactive frontal teaching • Case studies • Working on exercises
Required attendance
Examination (type of examination, scope)
Exam, 60 Minutes, 100%
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
Literature references will follow at the beginning of the course.
Additional notes
The course will be extended by guest lectures and case studies if necessary. The course is a **lecture with seminar character**. The emphasis is on an interactive form of teaching and learning and is achieved, among others, through the work on and presentation of practical case studies.

37502 IT Architecture Management

Module number
37502
Course name
IT Architecture Management
Module coordinator
Prof. Dr. Thomas Widjaja

Examination number	Credit points (ECTS)	Hours per week (SWS)
283004	5	4
Availability	**Duration**	**Recommended semester**
every summer semester	1 Semester	

Workload
Lecture 2 SWS (30 hours class attendance; 45 hours self-study) Exercise 2 SWS (30 hours class attendance; 45 hours self-study) Calculation is based on: every hr./sem.-week corresponds to 60 minutes. One semester is presumed to be 15 weeks, i.e. 14 course + 1 exam week
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
According to § 3 of the study and examination regulations for the Master's degree programme in Business Information Systems. Successful attendance of the module "IT Management" (or comparable knowledge requirement) is recommended.
Requirements
Language of instruction
English

Content
IT architectures define the company's IT components and their interactions. This module provides an overview of the tasks and objectives of IT architecture management and covers the following topics in more detail: 1. Introduction and Overview (information systems, systems theory, IT architecture, enterprise architecture, IT architectures as models, meta-models, and goals of IT architecture management). 2. Operating Model (standardization, integration, types of operating models, enterprise architecture core diagrams) 3. Frameworks for IS architecture management 4. Maturity levels of IT architectures (cost, management, outsourcing, and agility aspects of maturity levels of IT architectures) 5. Management of IT complexity (complex adaptive systems, emergence, IT complexity, IT heterogeneity, Ashby's Law of Requisite Variety, standards, management of functional redundancy)

6. Modularity (design structure matrices, IT architecture modularity and IT governance decentralization, design parameters, bi-modal architectures, and organizational ambidexterity)
7. Architecture of digital platforms and Decentralized Autonomous Organizations (DAOs) (layered modular architecture, generativity, platform governance and boundary resources, platform openness).

Intended learning outcomes (ILOs)

Students, who have successfully participated in the module,

- classify enterprise architecture management as a sub-field of IT management.
- explain the goals of IT architecture management and their dependencies.
- explain the interactions between enterprise architectures and IT architectures.
- model enterprise and IT architectures from different perspectives.
- classify the management of redundancy and degree of standardization as central tasks of IT architecture management.
- explain the essential frameworks and methods for IT architecture management.
- implement the essential frameworks and methods for IT architecture management.

Teaching methods

- Interactive frontal teaching
- Case studies
- Working on exercises

Required attendance

Examination (type of examination, scope)

Exam, 60 Minutes, 100 %

Overall grade relevance

Exam resit opportunities

Exam resits are detailed in § 6 of the subject-specific study and examination regulation.

Recommended reading

Additional notes

The course will be extended by guest lectures if necessary. Literature references will follow at the beginning of the course.

37504 IT-Services und IT-Servicemanagement

Modulnummer
37504
Veranstaltungstitel
IT-Services und IT-Servicemanagement
Modulverantwortliche*r / Prüfer*innen
Prof. Dr. Thomas Widjaja

Prüfungsnummer	**ECTS**	**SWS**
266180	5	4
Modulangebot	**Zeitdauer des Moduls**	**Empfohlenes Studiensemester**
jedes Wintersemester (nicht im WiSe 25/26)	1 Semester	

Workload
Vorlesung 2 SWS (30 St. Präsenzzeit und 45 St. Eigenarbeitszeit) Übung 2 SWS (30 St. Präsenzzeit und 45 St. Eigenarbeitszeit) Es wird mit 15 Semesterwochen gerechnet (14 Vorlesungs- + 1 Prüfungswoche) und jede SWS geht mit 60 Minuten in die Berechnung ein.
Verwendbarkeit
Wirtschaftsinformatik/ Information Systems
Bezug zur LPO I
Empfohlene Voraussetzungen
Gem. § 3 der Studien- und Prüfungsordnung für den Masterstudiengang Wirtschaftsinformatik. IT-Management sowie Geschäftsprozessmanagement aus dem Bachelor-Studiengang Wirtschaftsinformatik oder gleichwertige Kenntnisse empfohlen.
Verpflichtende Voraussetzungen
Unterrichtssprache
Deutsch

Inhalt
Die Vorlesung setzt sich mit den zentralen IT-Managementaufgaben zur Erbringung von Services auseinander. Folgende Themen werden unter anderem behandelt: 1. Einführung und Überblick über digitale Dienstleistungen und das Management Digitaler Dienstleistungen aus zwei Perspektiven 2. Service Dominant Logic (SDL) 3. Digitalisierungsgrad von Services 4. Qualität von Services: u. a. „SERVQUAL“ zur Messung der Servicequalität sowie IT-spezifische Anpassungen (z. B. e-SERVQUAL) 5. Serviceorientierte Architekturen 6. Cloud Computing und Software as a Service (SaaS) 7. Nutzerdatenbasierte Services

8. IT-Service-Management: Aufgaben des IT-Service-Managements, Modelle und Rahmenkonzepte (ITIL, COBIT), Unterstützung durch Software-Werkzeuge
Lernergebnisse Lernziele
Studierende, die an diesem Modul teilgenommen haben, • erklären die wichtigsten Grundbegriffe aus dem Bereich des IT-Service-Managements. • spezifizieren IT-Services korrekt. • unterstützen Organisationen bei der Entscheidung, ob ein IT-Service selbst erstellt oder vom Markt bezogen werden sollte. • setzen Verfahren zur Messung der IT-Servicequalität um. • bestimmen den Digitalisierungsgrad von Services. • erklären die wesentlichen Parameter beim Erstellen von nutzerdatenbasierten Services nennen und deren Zusammenhänge. • beschreiben die Wirkung von IT-Service-Management auf IT-Business-Alignment.
Lehr- und Lernformen
• Interaktiver Frontalunterricht • Bearbeitung von Fallstudien in Gruppenarbeit • Praktische Übung
Anwesenheitspflicht
Prüfungsleistung (Prüfungsform, Umfang, Gewichtung)
Klausur, 60 Minuten, 100 %
Gesamtnotenrelevanz
Wiederholungsmöglichkeit
Bei Nichtbestehen können alle Veranstaltungen gemäß § 6 der Fachstudien- und -prüfungsordnung wiederholt werden.
Literatur
Weitere Hinweise
Die Veranstaltung wird ggf. um Gastvorträge erweitert. Literaturhinweise folgen zu Beginn der Lehrveranstaltung. **WICHTIG: Im WiSe 25/26 findet diese Veranstaltung NICHT statt, da sich Prof. Widjaja im Forschungsfreisemester befindet.**

37506 Master Seminar Business Information Systems

Module number
37506
Course name
Master seminar
Module coordinator/ examiner(s)
Prof. Dr. Thomas Widjaja

Examination number	Credit points (ECTS)	Hours per week (SWS)
266592	7	2
Availability	**Duration**	**Recommended semester**
Irregularly	1 semester	

Workload
Seminar 2 SWS (30 hours class attendance; 180 hours self-study) Exercise 2 SWS (30 hours class attendance; 45 hours self-study) Calculation is based on: every hr./sem.-week corresponds to 60 minutes. One semester is presumed to be 15 weeks, i.e. 14 course + 1 exam week
Module applicability
Wirtschaftsinformatik/ Information Systems
LPO I applicability
Recommended prerequisites
According to § 3 of the study and examination regulations for the Master's degree program in Information Systems.
Requirements
Language of instruction
English

Content
The aim of the seminar is to examine current, practice-relevant issues in business information systems in a theory-driven way. The seminar topics are based on the research areas of the chair. Written work: Students must write a seminar paper on current topics in business informatics. The work can also include own empirical research. Oral presentation: Presentation and discussion of the seminar paper.
Intended learning outcomes (ILOs)
After successfully completing the seminar, students are able to: • explain, structure and evaluate topics that are currently being discussed in research in the field of business informatics. • effectively research, structure and evaluate relevant scientific literature and embed it in their own argumentation in a reflective way in a scientific paper.

- reflect on critical comments in the process of writing a scientific paper and critically evaluate other works themselves.
- create an independent scientific paper that is formally correct according to the rules of good scientific work and is structured and creative in terms of content.

Teaching methods

- Workshops for presenting and discussing interim results in the group and with the supervising lecturers
- Individual support
- Individual preparation of a seminar paper
- Presentation of the seminar paper and discussion of the results

Required attendance

Examination (type of examination, scope)

Portfolio:

- Term paper, approx. 15 pages
- Oral performance (presentation and discussion), presentation approx. 10 minutes, discussion approx. 5 minutes

Overall grade relevance

Exam resit opportunities

If you fail, you can repeat all courses in accordance with § 6 of the subject-specific study and examination regulations.

Recommended reading

Additional notes

Registration is required for both the chair and Stud.IP! Further information can be found on the chair's homepage.
If requested by all participants, the course can be held in German. The term paper can be submitted in either English or German.

37507 Data Analysis in R for Information Systems Research

Module number
37507
Course name
Data Analysis in R for Information Systems Research
Module coordinator
Prof. Dr. Thomas Widjaja

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
266501	2	2
Availability	**Duration**	**Recommended semester**
Every summer semester	1 semester	

Workload
Lecture 2 SWS (30 hours class instruction; 30 hours self-study) Calculation is based on: every hr./sem.-week corresponds to 60 minutes. One semester is presumed to be 15 weeks, i.e. 14 course + 1 exam week
Module applicability
- Methods - Wirtschaftsinformatik/Information Systems
Reference to the LPO I
Recommended prerequisites
In accordance with § 3 of the study and examination regulations for the master degree program information systems. Students should have knowledge in statistics on master level (preferably via the complementary course ‘Computational Statistics – Regression in R’). It is possible to attend this course and the complementary course ‘Computational Statistics – Regression in R’ in the same semester (see “additional notes” for further information). Also, students should be familiar with the programming language R and RStudio (e.g., via prior experience or reading of the online documentation).
Requirements
Language of instruction
English

Content
The application of computational, data-driven research methods is an important skill for information systems researchers. These research methods can use data from various sources such as surveys. To analyze the data sets, this course focuses on structural equation modeling. The course provides the necessary statistical foundations and introduces the basic concepts and techniques of structural equation modeling. The concepts and techniques are applied to a self-collected real-world data-set and application examples from information systems research. The implementation of our own structural equation models will be demonstrated using the programming language R. On this basis, the course covers the following topics: 1. Specification of measurement models 2. Specification of structural models

3. Data collection and examination 4. PLS path model estimation 5. Reflective and formative measurement model assessment 6. Assessment of the structural model 7. Moderator and mediator analysis
Intended learning outcomes (ILOs)
Students, who have successfully participated in this module, • have gone through the research process from data collection to analysis • can differentiate different techniques for structural equation modeling • can assess structural equation models used in information systems research papers • are able to handle data sets and estimate their own structural equation models
Teaching methods
Lecture with seminar character. The lecture will be conducted through an interactive classroom lecture, with real world exercises in the computer lab. Individual student presentations will be discussed in the classroom. Additionally, teams of students will analyze a self-collected data set from the context of information systems through structural equation modelling using R and consolidate their analysis results in a written report.
Required attendance
Examination (type of examination, scope)
To successfully pass the course, teams of students must analyze a data set from the context of information systems research. The teams provide a written report about their analysis (approx. 10 pages) which is worth 60% of the course grade. The teams of students additionally give an oral presentation (approx. 5 minutes per team member) followed by a discussion (approx. 10 minutes) about the analysis which they have conducted, which is worth 40%.
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
Additional notes
• Hands-on exercises on techniques of structural equation modeling in the computer lab using R • Collection of field data conducted by teams of students • Please visit the website of the chair (www.bis.uni-passau.de) four weeks before the semester starts for information about the enrolment (especially for information about attendance on this course and the complementary course ‘Computational Statistics – Regression in R’)

37509 Cloud Anwendungsentwicklung und Applikationstest

Modulnummer
37509
Veranstaltungstitel
Cloud Anwendungsentwicklung und Applikationstest
Modulverantwortliche*r / Prüfer*innen
Prof. Dr. Widjaja, Dr. Maximilian Reiter

Prüfungsnummer	**ECTS**	**SWS**
283017	5	2
Modulangebot	**Zeitdauer des Moduls**	**Empfohlenes Studiensemester**
Jedes Wintersemester	14 Tage (Blockveranstaltung)	3

Workload
14-tägige Blockveranstaltung vor Beginn des Semesters Es wird mit folgendem Aufwand gerechnet: • 6 Stunden pro Tag mit Dozenten • Ca. 2 Stunden Nachbereitungszeit pro Tag • Ca. 4 Stunden Vorbereitungszeit für Abschlussvortrag
Verwendbarkeit
Wirtschaftsinformatik/ Information Systems
Bezug zur LPO I
Empfohlene Voraussetzungen
Keine
Verpflichtende Voraussetzungen
Programmierkenntnisse (z.B. mit JavaScript oder TypeScript) sind erforderlich, da diese nicht im Rahmen der 2-wöchigen Blockveranstaltung vermittelt werden können. Zur Überprüfung der empfohlenen Voraussetzungen ist ein gesondertes Anmeldeverfahren vorgesehen. Bewerbungsfristen und Bewerbungsmodus werden den Studierenden rechtzeitig über die studienbezogenen Informationskanäle mitgeteilt.
Unterrichtssprache
Deutsch

Inhalt
• Einführung in Domain Driven Design und Microservices • Grundlagen Qualitätssicherung • Arbeiten im agilen Umfeld • Agiles Testen • Einführung in die Cloudentwicklung • Architektur Cloud-nativer Anwendungen • Entwicklung Cloud-nativer Anwendungen • Testautomatisierung Cloud-nativer Anwendungen

Das Modul führt Studierende in die aktuelle Softwareentwicklungspraxis ein. Der Schwerpunkt liegt dabei auf der Softwareentwicklung in der Cloud und insbesondere dem Testen der erzeugten Software.
Im Rahmen der 14-tägigen Veranstaltung wird eine kleine App entwickelt und getestet. Als Vorgehensmodell wird ein agiler Ansatz gewählt, da ein Großteil der Software heutzutage auf Basis dieses Vorgehensmodells erstellt wird. Dabei wird auf diejenigen Konzepte näher eingegangen, die auch im Rahmen dieses Moduls zum Einsatz kommen.

Lernergebnisse Lernziele

Nach erfolgreicher Teilnahme am Modul 37509

- verstehen Studierende, wie Software zum aktuellen Zeitpunkt entwickelt wird
- können Studierende die agilen Methoden von Scrum in der Praxis anwenden
- können Studierende Applikationen in der AWS-Cloud entwickeln
- können Studierende begründen, wie durch Tests qualitativ hochwertige Software entsteht

Lehr- und Lernformen

Interaktiver Frontalunterricht. Die Praxisübungen sind in die Blockveranstaltung integriert.

Anwesenheitspflicht

Ja

Prüfungsleistung (Prüfungsform, Umfang, Gewichtung)

Selbständige Bearbeitung eines Projekts, Präsentation.
Bewertung der Projektergebnisse (100 % der Gesamtnote) mit einer Note am Ende der Blockveranstaltung (inkl. Zwischendokumente und Projektplanung, System- und Benutzerdokumentation des fertigen Endproduktes).
Portfolioprüfung.

Gesamtnotenrelevanz

Wiederholungsmöglichkeit

Keine Wiederholungsmöglichkeit der Prüfung; Bei Nichtbestehen können alle Veranstaltungen gemäß § 6 der Fachstudien- und -prüfungsordnung wiederholt werden.

Literatur

Weitere Hinweise

39606 Master Seminar Telecommunications and Internet Business

Module number
39606
Course name
Masterseminar
Module coordinator
Prof Dr Jan Krämer

Examination number	Credit points (ECTS)	Hours per week (SWS)
266210	7	2
Availability	**Duration**	**Recommended semester**
Every semester	1 semester	One semester before writing the Master's thesis

Workload
Seminar 2 SWS (30 hours attendance time and 180 hours individual work time) The calculation is based on 15 semester weeks (14 lecture weeks + 1 examination week) and each SWS is counted as 60 minutes.
Module applicability
Wirtschaftsinformatik / Information Systems
Reference to LPO I
Recommended prerequisites
In accordance with § 3 of the study and examination regulations for the Master's degree programme in Wirtschaftsinformatik.
Requirements
Language of instruction
English

Content
Preparation of a seminar paper in the field of the Internet and telecommunications business. Thesis must be problem-orientated and contain own work in the form of a critical analysis of literature or a discussion of scientific methodology. The problem, objectives and approach of the work as well as the results of the study must be presented and discussed.
Intended learning outcomes (ILOs)
Students who have taken part in the module "Master Seminar Telecommunications and Internet Business": • explain their own scientific approach in the preparation of their seminar paper • know the basics of scientific work and can analyse and interpret their research topic scientifically. • present connections between their own work and topics from research in the field of Internet and telecommunications business • acquire knowledge of presentation and communication techniques and are able to formulate and argue in defence of their subject-related positions and problem solutions. • assess the quality of sources

• develop the ability to systematically and structurally analyse the scientific literature on a specific issue and to summarise and evaluate the Content.
Teaching methods
• Individual preparation of a seminar paper • Presentation of the seminar paper • Discussion of the results
Required attendance
Examination (type of examination, scope)
Successful participation in the seminar requires written and oral performance. The written assignment consists of a 15-page term paper. The oral performance consists of a presentation of your own work (approx. 20 minutes) and an active discussion of your own and other students' work. Portfolio examination
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
Additional notes
Please register via the chair. Further information can be found on the chair's website.

39607 Master Colloquium in Internet and Telecommunications Business

Module number
39607
Course name
Masterkolloquium
Module coordinator
Prof Dr Jan Krämer

Examination number	Credit points (ECTS)	Hours per week (SWS)
283001	1	1
Availability	**Duration**	**Recommended semester**
every semester	1 semester	The module must be completed alongside the Master's thesis.

Workload
Colloquium 1 SWS (15 hours attendance time and 15 hours individual work time) The calculation is based on 15 semester weeks (14 lecture weeks + 1 examination week) and each SWS is counted as 60 minutes.
Module applicability
Wirtschaftsinformatik / Information Systems
Reference to LPO I
Recommended prerequisites
In accordance with § 3 of the study and examination regulations for the Master's degree programme in Information Systems. The module must be completed alongside the Master's thesis.
Requirements
Admission to the final thesis and completion at the chair is a prerequisite for participation in the colloquium.
Language of instruction
English

Contents
The colloquium provides an introduction to scientific work and supplements any previous knowledge. It provides the necessary knowledge for the final thesis in i) scientific research and assessment of the quality of sources, ii) scientific writing and citation, iii) scientific presentation, as well as iv) an introduction to LaTeX. In addition, the colloquium allows students to present and discuss their own Master's thesis in a plenary session.
Intended learning outcomes (ILOs)
Students who have taken part in the module "Master's Colloquium in Internet and Telecommunications Business": • explain their own scientific approach when writing their thesis • use their knowledge of scientific literature to write their thesis in accordance with the rules of good scientific work, formally correct and structured in terms of Content

• present connections between their own work and topics from research in the field of Internet and telecommunications business • illustrate and present their final thesis, taking into account the requirements of academic writing and citation • assess the quality of sources • develop a deeper understanding of scientific work and presentation and how to deal with criticism and the realisation of critical comments
Teaching methods
• Discussion and joint development of the teaching Content • Presentation of individual topics by students and doctoral candidates
Required attendance
Examination (type of examination, scope)
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
An initial bibliography will be provided during the first counselling interview.
Additional notes
The module is compulsory for students writing their Master's thesis at the chair. Please note the regulations for registering theses at the chair. Admission to the thesis is a prerequisite for participation in the colloquium.

39612 Digital Markets and Online Platforms

Module number
39612
Course name
Digital Markets and Online Platforms
Module coordinator
Prof. Dr. Jan Krämer

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
266201	5	4
Availability	**Duration**	**Recommended semester**
Every winter semester	1 Semester	

Workload
Lecture 2 SWS (30 hrs. attendance and 45 hrs. self-study) Tutorial 2 SWS (30 hrs. attendance and 45 hrs. self-study) Es wird mit 15 Semesterwochen gerechnet (14 Vorlesungs- + 1 Prüfungswoche) und jede SWS geht mit 60 Minuten in die Berechnung ein.
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
Gem. § 4 der Prüfungs- und Studienordnung für den Masterstudiengang Wirtschaftsinformatik (Information Systems). Basic knowledge of economics is highly recommended. Ideally, but not necessarily, basic knowledge of the Internet economy.
Requirements
Language of instruction
English

Content
The lecture lays a methodological foundation in the economics of digital markets and online platforms, while paying special attention to strategic, technological and behavioral aspects of platform design. Particularly, this includes the following topics: • Strategies for successful launch and governance of platforms • Managing openness of platform ecosystems • Reviews, Ratings and Recommender Systems • Pricing on two-sided platforms • Data-driven platform design and consumer behavior • Regulating market power and competition issues in digital markets

Intended learning outcomes (ILOs)

Students who have successfully participated in the module “Digital Markets and Online Platforms”,

- explain the current state of research on online platforms, firms' strategies in digital markets and the ongoing policy debate on regulation of digital markets.
- interpret business models, governance and design, and competition in the Internet economy.
- perform a complete analytical (algebraic) equilibrium analysis of game-theoretic models for competition between two-sided platforms.
- understand the design of and computations performed by various types of recommender systems.
- illustrate how platform design decisions shape behavior of economic actors on a platform.
- assess how different methodological approaches in the literature contribute to a better understanding of the topic and, where appropriate, to academic or policy debates.
- develop holistic strategies for platform businesses taking into account the idiosyncratic characteristics of digital markets.

Teaching methods

- Interactive lecture
- Tutorial

Required attendance

Examination (type of examination, scope)

Final exam 60 minutes - 100 %

Overall grade relevance

Exam resit opportunities

Exam resits are detailed in § 6 of the subject-specific study and examination regulation.

Recommended reading

- Parker, G., van Alstyne M., Choudary S. (2016). Platform Revolution. W. W. Norton & Company, Inc.
- Belleflamme, P & M. Peitz (2021). The Economics of Platforms: Concepts and Strategies. Cambridge University Press.

Additional notes

- All teaching material in English language
- Teaching language in English
- Replaces the course “Electronic Markets”, students who have already completed the course “Electronic Markets” (PN: 266200) cannot register for this course.

39614 Governance of Platforms and Ecosystems

Module number
39614
Course name
Governance of Platforms and Ecosystems
Module coordinator
Dr. Chayanin Wipusanawan

Examination number	Credit points (ECTS)	Hours per week (SWS)
283019	5	3
Availability	**Duration**	**Recommended semester**
Irregular	1 semester	

Workload
Lecture 2 SWS (30 hrs. attendance and 70 hrs. self-study) Tutorial 1 SWS (15 hrs. attendance and 35 hrs. self-study) The calculation is based on 15 semester weeks (14 lecture weeks + 1 examination week) and each SWS is included in the calculation with 60 minutes.
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
Gem. § 4 der Prüfungs- und Studienordnung für den Masterstudiengang Wirtschaftsinformatik (Information Systems). Basic knowledge of microeconomics is highly recommended.
Requirements
Language of instruction
English

Content
This module explores the economic principles that shape the governance and regulation of relationships between firms in digital network industries. Key topics include: • Compatibility and the standardization process • Competition policy in digital markets • Sector-specific regulations for network industries and digital platforms Students will gain insights into the economic dynamics driving digital markets and the regulatory frameworks that influence competition, innovation, and industry standards.

Intended learning outcomes (ILOs)
Students who have successfully completed the module are able to • solve basic game-theoretical models of competition between firms and discuss the implications of the results on firm strategies and public policies • explain the economic theories on compatibility and standardization, including their implications on competition and consumers • explain and analyze competition policy issues pertaining to digital markets and platforms based on economic theory
Teaching methods
• Interactive lecture • Tutorial
Required attendance
Examination (type of examination, scope)
Final exam (60 minutes): 100%
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
Additional notes
• All teaching material in English language • Teaching language in English

39720 Fundamentals of Business Analytics

Module number
39720
Course name
Fundamentals of Business Analytics
Module coordinator
Prof. Dr. Harry Haupt, Prof. Dr. Dirk Totzek, PD Dr. Joachim Schnurbus, Prof. Dr. Marc Goerigk

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
261003	5	5
Availability	**Duration**	**Recommended semester**
Every semester	Block	1

Workload
5 SWS (150h of own work)
Module applicability
Interdisziplinäres Vertiefungsangebot
Reference to the LPO I
Recommended prerequisites
Basic knowledge in quantitative methods at the level of a management-oriented or economics-oriented bachelor’s degree
Requirements
None
Language of instruction
English

Content
Data Literacy (i.e., competencies in Data Analytics and Data-Driven Decision Making) and Mathematical Literacy (i.e., the fundamentals in Mathematics and Statistics) form a fundamental framework of modern management. These core competencies are refreshed and strengthened in this course. The course covers four subject areas.: 1) Fundamentals of Mathematics: Sums, products, sets, linear equations, inequalities Calculus (functions, limits, derivatives and integration) Linear algebra (matrix algebra and systems of linear equations) 2) Fundamentals of Statistics Random variables and stochastic modeling Estimation and test theory Regression modeling 3) Fundamentals of Management Science Modeling of optimization problems Introduction to algorithms, heuristics and metaheuristics Linear programming

4) Fundamentals of Empirical Research Methods Business research process Primary and secondary data collection methods Hypothesis testing
Intended learning outcomes (ILOs)
Students who have successfully participated in the module "Fundamentals of Business Analytics" are able to identify appropriate quantitative methods to address questions and challenges in modern data-driven management, are able to reflect on the underlying elementary mathematical, statistical, optimization foundations and on the corresponding empirical research process, apply the methods and interpret the result from a management or economic perspective.
Teaching methods
E-learning/online course with supporting live sessions Intensive block course at the beginning of the semester (~ 4 weeks) individual learning organization, based on knowledge and competencies identified in the placement test
Required attendance
Examination (type of examination, scope)
Portfolio examination. The final grade depends on the successful completion of e-assessments qualifying in all four subject areas of the course.
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
Additional notes
Online course

39802 Masterseminar Wirtschaftsinformatik Daten- und Informationsmanagement

Modulnummer
39802
Veranstaltungstitel
Masterseminar
Modulverantwortliche*r / Prüfer*innen
Prof. Dr. Jin Gerlach

Prüfungsnummer	**ECTS**	**SWS**
283015	7	2
Modulangebot	**Zeitdauer des Moduls**	**Empfohlenes Studiensemester**
Jedes Wintersemester	1 Semester	

Workload
Seminar 2 SWS (30 St. Präsenzzeit und 180 St. Eigenarbeitszeit) Es wird mit 15 Semesterwochen gerechnet (14 Vorlesungs- + 1 Prüfungswoche) und jede SWS geht mit 60 Minuten in die Berechnung ein.
Verwendbarkeit
Wirtschaftsinformatik/ Information Systems
Bezug zur LPO I
Empfohlene Voraussetzungen
Gem. § 3 der Studien- und Prüfungsordnungen für den Masterstudiengang Wirtschaftsinformatik.
Verpflichtende Voraussetzungen
Unterrichtssprache
Deutsch

Inhalte
Im Rahmen des Seminars werden aktuelle Themen der Wirtschaftsinformatik untersucht, die im Bereich der Forschungsschwerpunkte des Lehrstuhls angesiedelt sind. Schriftliche Leistung: Anfertigung einer Seminararbeit zu ausgewählten Seminarthemen. Im Rahmen der Seminararbeit soll eine wissenschaftliche Auseinandersetzung mit bestehender Theorie und ggf. Methoden im jeweiligen Themenbereich erfolgen. Auch eine eigene empirische Untersuchung kann Bestandteil der Seminararbeit sein. Mündliche Leistung: Im Rahmen einer Präsentation wird die eigene Arbeit (Problemstellung, Ziele, Vorgehen und Ergebnisse) vorgestellt und mit den anderen Seminarteilnehmenden diskutiert.
Lernergebnisse Lernziele
Studierende, die an dem Modul „Masterseminar Daten- und Informationsmanagement“ teilgenommen haben: • erläutern ihr eigenes wissenschaftliches Vorgehen bei der Erstellung ihrer Seminararbeit,

• nutzen die Grundlagen wissenschaftlichen Arbeitens und interpretieren ihr Forschungsthema wissenschaftlich, • stellen Zusammenhänge zwischen ihrer eigenen Arbeit und der Themenstellung aus der Forschung im Bereich Daten- und Informationsmanagement dar, • erwerben Kenntnisse der Präsentations- und Kommunikationstechniken, • formulieren ihre fachbezogenen Positionen und Problemlösungen und verteidigen diese argumentativ, • beurteilen die Qualität von Quellen, • und entwickeln die Fähigkeiten, die Fachliteratur zu einer spezifischen Fragestellung systematisch und strukturiert zu erfassen und die Inhalte zu beurteilen. Ziel des Seminars ist die Vertiefung der Kenntnisse in ausgewählten Themenbereichen der Wirtschaftsinformatik. Die Studierenden erlernen dabei Grundlagen des wissenschaftlichen Arbeitens, um sich kritisch mit den Grenzen des bestehenden Wissens auseinandersetzen zu können. Im Rahmen der Präsentation verbessern die Studierenden ihre Präsentations- und Kommunikationsfähigkeiten und lernen, sich an wissenschaftlichen Diskussionen zu beteiligen.
Lehr- und Lernformen
• Workshops zur Präsentation und Diskussion von Zwischenergebnissen, gemeinsam mit anderen Seminarteilnehmenden und Dozenten • Individuelle Betreuung der Studierenden • Individuelle Erstellung der Seminararbeit • Präsentation der Seminararbeit und Diskussion der Ergebnisse
Anwesenheitspflicht
Prüfungsleistung (Prüfungsform, Umfang)
Portfolio. Hausarbeit, ca. 15-seitige Mündliche Leistung (Vortrag und Diskussion), Vortrag ca. 20 Minuten, Diskussion ca. 10 Minuten
Gesamtnotenrelevanz
Wiederholungsmöglichkeit
Bei Nichtbestehen können alle Veranstaltungen gemäß § 6 der Fachstudien- und -prüfungsordnung wiederholt werden.
Literatur
Weitere Hinweise
Anmeldung über den Lehrstuhl. Weitere Informationen dazu finden Sie auf der Lehrstuhl-Homepage.

39803 Strategies in the Software Industry

Module number
39803
Course name
Strategies in the Software Industry
Module coordinator
Prof. Dr. Jin Gerlach

Examination number	Credit points (ECTS)	Hours per week (SWS)
283014	5	2+2
Availability	**Duration**	**Recommended semester**
Every winter semester	1 semester	

Workload
Lecture 2 SWS (30 hrs. attendance time and 45 hrs. self-study time) Exercise 2 SWS (30 hrs. attendance time and 45 hrs. self-study time) The calculation is based on 15 semester weeks (14 lecture weeks + 1 examination week) and each SWS is included in the calculation with 60 minutes.
Module applicability
Wirtschaftsinformatik / Information Systems
Reference to the LPO I
Recommended prerequisites
According to § 3 of the study and examination regulations for the Master's degree programme Information Systems.
Requirements
Language of instruction
English

Content
With many of the big tech companies being software companies nowadays, software is no longer only a product. Instead, a business model has developed around software. However, software characteristics differ from physical products, making it important to take specific strategic considerations into account. This course addresses the specifics of software as a good as well as the software industry and resulting consequences for strategies of software providers (e.g., software startups or established tech firms). Essential Contents include: • Characteristics of digital goods • Network effects and network effect markets • Digital value chains • Platforms • Fundamental principles of the software industry • Cloud computing and Software as a Service

- Pricing strategies for software vendors
- Cooperation strategies for software vendors
- The value of data
- Data-based business models
- Privacy in data-based business models
- Specifics of Open Source Software

Intended learning outcomes (ILOs)

This course aims to provide fundamental knowledge on the specifics of the software industry with a focus on strategies in the software industry for software providers. After attending this course, the students

- explain central factors and specifics of software from an economic point of view,
- explain important aspects of the market for software,
- and, based on their acquired knowledge, students develop management decisions for software companies and develop strategies for software vendors.

Teaching methods

Interactive frontal teaching
Processing of exercise tasks

Required attendance

Examination (type of examination, scope)

Exam, 60 minutes, 100 %

Overall grade relevance

Exam resit opportunities

Exam resits are detailed in § 6 of the subject-specific study and examination regulation.

Recommended reading

Additional notes

- All teaching material in English language
- Teaching language also in English

39807 Management of Information Security and Privacy

Module number
39807
Course name
Management of Information Security and Privacy
Module coordinator
Prof. Dr. Jin Gerlach

Examination number	Credit points (ECTS)	Hours per week (SWS)
250216	5	2+2
Availability	**Duration**	**Recommended semester**
Every winter semester	1 semester	

Workload
Lecture 2 SWS (30 hrs. attendance time and 45 hrs. self-study time) Exercise 2 SWS (30 hrs. attendance time and 45 hrs. self-study time) The calculation is based on 15 semester weeks (14 lecture weeks + 1 examination week) and each SWS is included in the calculation with 60 minutes.
Module applicability
Wirtschaftsinformatik / Information Systems
Reference to the LPO I
Recommended prerequisites
According to § 3 of the study and examination regulations for the Master's degree programme Information Systems.
Requirements
Language of instruction
English

Content
The ongoing digitization increases the importance for organizations to protect their digital assets, customer information, and privacy. To ensure such protection, organizations must adequately manage information security and customer privacy, which is associated with numerous challenges. This course addresses central organizational and management issues, processes, frameworks, theories, and challenges associated with the management of information security and privacy. Note: the course focuses on a management/organizational perspective. It is not a technical course. Topics covered by this course are: • Basic concepts associated with information security and privacy • Risk management techniques for information security • Organization of information security and privacy management • Investment decisions with respect to information security • Countermeasures for preventing information security and privacy incidents

- Measures for detecting security breaches
- Responding to information security breaches
- Tensions and tradeoffs with respect to privacy management
- Ethical perspectives on managing information security and privacy

Intended learning outcomes (ILOs)

This course aims to provide advanced knowledge on the management of information security and privacy in organizations. After attending this course, students

- explain key challenges regarding the management of information security and privacy in organizations,
- conceptualize organizational measures that help to improve information security and privacy protection,
- and, based on the knowledge they have acquired, students develop well-founded management decisions in organizations to enhance information security and privacy protection.

Teaching methods

Interactive frontal teaching
Processing of exercise tasks

Required attendance

Examination (type of examination, scope)

Exam, 60 minutes, 100 %

Overall grade relevance

Exam resit opportunities

Exam resits are detailed in § 6 of the subject-specific study and examination regulation.

Recommended reading

Additional notes

- All teaching material in English language
- Teaching language also in English

39908 Scientific Computing and Digital Reporting with Python

Module number
39908
Course name
Scientific Computing and Digital Reporting with Python
Module coordinator
Prof. Dr. Ralf Kellner

Examination number	Credit points (ECTS)	Hours per week (SWS)
262107	5	4
Availability	**Duration**	**Recommended semester**
Every summer semester	1 semester	

Workload
150 h (60 h contact studies / 90 h self-studies)
Module applicability
Wirtschaftsinformatik / Information Systems
Reference to the LPO I
Recommended prerequisites
Mathematics and statistics from the Bachelor's programme. At best, the course ‘Fundamentals of Business Analytics’ (39720) has already been taken beforehand.
Requirements
Language of instruction
English

Content
• Introduction to programming with Python • Statistical models (sklearn, statsmodels, etc. and own implementation) • Optimization using gradient-based algorithms (Scipy, Tensorflow, Pytorch) • Matrix decompositions with application examples such as principal component analysis • Access to data using APIs and web scraping • Digital reporting with the help of a specially programmed web application • Final project: data reference, analysis using a model, reporting of the results using a customized web app
Intended learning outcomes (ILOs)
After successfully completing the course, students will be able to carry out advanced data analyses using the Python programming language and inform external parties about the relevant results of the analyses in an appropriate manner. This includes all individual steps from collecting their own data, identifying and carrying out their own analyses to making the results accessible. In addition, course participants gain in-depth knowledge of the statistical modelling of financial market data. In addition to specific applications, the general competence of independent learning of new statistical models is trained.

Teaching methods
• Interactive lectures • Interactive exercises • Digital teaching materials on programming with Python and the methodological basics of the course
Required attendance
Examination (type of examination, scope)
• Written exam • Digital exam
Overall grade relevance
Exam resit opportunities
In the event of failure, all courses can be repeated in accordance with § 6 of the subject-specific study and examination regulations.
Recommended reading
• Deep Learning (2016) – Goodfellow, I., Bengio, Y., Courville, A.; MIT Press • The Elements of Statistical Learning (2017) - Hastie, T., Tibshirani, R., Friedman, J.; Springer • Hands-On Machine Learning with Scikit-Learn, Keras & Tensorflow (2017) – Geron, A.; Wiley • Learn Python Programming (2018) – Romano, F., Packt Publishing Ltd. • Web Scraping with Python (2018) - Ryan Mitchell, O'Reilly Media, Inc.
Additional notes

39910 Financial Data Analytics and Machine Learning

Module number
39910
Course name
Financial Data Analytics and Machine Learning
Module coordinator
Prof. Dr. Ralf Kellner

Examination number	Credit points (ECTS)	Hours per week (SWS)
262502	5	4
Availability	**Duration**	**Recommended semester**
Every summer semester	1 semester	

Workload
150 h (60 h contact studies / 90 h self-studies)
Module applicability
Wirtschaftsinformatik / Information Systems
Reference to the LPO I
Recommended prerequisites
Fundamentals of mathematics and statistics.
Requirements
Language of instruction
English

Content
• Asset classes on capital markets • Stocks, bonds and options • Descriptive analysis of one- and multi-dimensional distributions of asset prices and returns • Introduction to portfolio theory • Factor models • Empirical analysis within and between asset classes • Principles of machine learning • Neural networks • Machine learning in the financial sector
Intended learning outcomes (ILOs)
Students gain a basic understanding of various asset classes on financial markets and the associated fundamental theories. Students are able to name the special features of financial data and apply the knowledge acquired in the course to real financial market developments. In addition, students understand how machine learning can be used in the financial sector in an insightful and informative way. Students interpret their own analyses, through which profound references to financial market theories are established.

Teaching methods
• Interactive lectures incl. digital documents • Interactive exercise units
Required attendance
Examination (type of examination, scope)
• Written exam
Overall grade relevance
Exam resit opportunities
In the event of failure, all courses can be repeated in accordance with § 6 of the subject-specific study and examination regulations.
Recommended reading
• Options, Futures and other Derivatives (2021) – John C. Hull, Pearson Verlag • Machine Learning in Finance (2021) – Dixon, M.F., Halperin, I., Bilokon, P.; Springer Verlag • Statistics and Data Analysis for Financial Engineering (2015) – Ruppert, D., Matteson, D. S.; Springer
Additional notes

39915 Deep Learning and Text Analysis in Finance

Module number
39915
Course name
Deep Learning and Text Analysis in Finance
Module coordinator
Prof. Dr. Ralf Kellner

Examination number	Credit points (ECTS)	Hours per week (SWS)
262503	5	4
Availability	**Duration**	**Recommended semester**
Every winter semester	1 semester	4

Workload
150 h (60 h contact studies / 90 h self-studies)
Module applicability
Wirtschaftsinformatik / Information Systems
Reference to the LPO I
Recommended prerequisites
Fundamentals of mathematics and statistics.
Requirements
Language of instruction
English

Content

- Text Preprocessing
- Simple frequency-based text models
- Quantitative basics for understanding advanced text models
- Word2Vec, Doc2Vec
- Text models with attention mechanisms: encoder and decoder models
- Use of text models in the financial sector
  - Information processing of capital market participants
  - Quantification of capital market reactions
  - Identification of companies with risks in relation to climate change and the transformation to a CO2-neutral economy

Intended learning outcomes (ILOs)

Students who have successfully completed this course

- develop a deep understanding of how modern text models work
- establish the connection between general machine learning methods and modern text modelling
- assess which form of text analysis is suitable for different situations

• use modern text models to analyse and evaluate important documents from the field of economics
Teaching methods
• Interactive lectures incl. digital documents • Interactive exercise units
Required attendance
Examination (type of examination, scope)
• Written exam
Overall grade relevance
Exam resit opportunities
In case of failure, all courses can be repeated according to § 6 of the subject study and examination regulations.
Recommended reading
• Machine Learning for Text (2018) – Aggarwal, C. C., Springer Verlag • When Is a Liability Not a Liability? Textual Analysis, Dictionaries, and 10-Ks (2011) – Loughran and McDonald, The Journal of Finance 66(1) • Disclosure Sentiment: Machine Learning vs. Dictionary Methods (2022) – Frankel et. al, Management Science 68(7)
Additional notes

5622V Software-Sicherheit / System Security

Modulnummer
5622V
Veranstaltungstitel
Software-Sicherheit / System Security
Modulverantwortliche*r / Prüfer*innen
Prof. Dr. Joachim Posegga

Prüfungsnummer	**ECTS**	**SWS**
405143	5	2V + 1Ü
Modulangebot	**Zeitdauer des Moduls**	**Empfohlenes Studiensemester**
jedes Sommersemester / every summer semester	1 Semester	

Workload
45 Std. Präsenz + 30 Std. Übungsaufgaben + 75 Std. Nachbearbeitung des Vorlesungsstoffes, Vorbereitung eines Referats und Prüfungsvorbereitung / 45 contact hours + 30 hrs exercises + 75 hrs follow-up, preparing a presentation and exam preparation
Verwendbarkeit
Wirtschaftsinformatik / Information Systems
Bezug zur LPO I
Empfohlene Voraussetzungen
Advanced IT Security
Verpflichtende Voraussetzungen
Keine / None
Unterrichtssprache
Deutsch oder Englisch / German or English

Inhalt
Der Inhalt des Moduls umfasst dabei z.B. risk & threat analysis, buffer und heap overflows, scripting languages, filter techniques, SQL injections, race conditions, attack surfaces, patch management, software testing, low level software security, Java security, reference monitors, least privilege principle, smart phone security, stack walks und history based access control. The content of the module includes, i.e., risk & threat analysis, buffer and heap overflows, scripting languages, filter techniques, SQL injections, race conditions, attack surfaces, patch management, software testing, low-level software security, Java security, reference monitors, leases privilege principle, smart phone security, stack walks and history based access control.
Lernergebnisse Lernziele
Kenntnisse / Skills/Knowledge Verständnis über Verwundbarkeiten deren Arten, Entstehung, Möglichkeiten der Ausnutzung und deren Folgen. Verstehen der Prinzipien für die Entwicklung sicherer Software. Überblick über Maßnahmen zur Schadensbegrenzung. Kenntnisse über Schritte zur forensischen Analyse von Sicherheitsvorfällen. Überblick der Akademische Leitsätze und praxisrelevante, „best practice“ Ansätze.

Understanding of the types of vulnerabilities, development, possibilities of use and its consequences. Understand the principles for the development of secure software. Overview of mitigation measures. Knowledge of steps for a forensic analysis of security incidents. Overview of Academic principles and practice-relevant “best practice“ approaches.

Fähigkeiten / Abilities
Aufspüren von Verwundbarkeiten; Ausbesserung von vorhandenen Verwundbarkeiten und forensische Analyse von Sicherheitsvorfällen
Detection of vulnerabilities; repair of existing vulnerabilities and forensic analysis of security incidents.

Kompetenzen / Competencies
Betrachtung von Systemen aus unterschiedlichen Blickwinkeln. Entwicklung, Analyse und Umsetzung möglicher Perspektiven und Reaktionsalternativen. Transformation und Reduktion akademischer Leitsätze auf praxisbezogene Anforderungen.
Consideration of systems from different angles. Development, analysis and implementation of possible perspectives and response alternatives. Transformation and reduction of academic principles to practical requirements.

Lehr- und Lernformen

Präsentation und Beamer, Tafel
Presentation and projector, blackboard

Anwesenheitspflicht

Prüfungsleistung (Prüfungsform, Umfang, Gewichtung)

Teilprüfungsleistungen:

- Referat: ca. 30-min. Referat mit Präsentation über selbsterarbeitetes Thema. Die Studierenden können am Semesterbeginn aus einer Auswahl von Themen wählen.
- Schriftliche/mündliche Prüfung: 60-min. schriftliche Prüfung oder ca. 20-min. mündliche Prüfung. Die Prüfungsart wird am Semesterbeginn durch den/die Dozent(in) festgelegt und bekanntgegeben.

Eine Anmeldung zum Referat impliziert automatisch eine Anmeldung zu einem der angebotenen Termine zur schriftlichen/mündlichen Prüfung im Anschluss an den gleichen Vorlesungszeitraum. Zum Bestehen des Moduls müssen beide Teilprüfungsleistungen bestanden werden. Dabei wird die schriftliche/mündliche Prüfung mit 80% gewichtet, das Referat mit 20%.

This module is assessed in partial examinations:

- Oral presentation: approx 20 min. Students in small groups will present selected topics chosen during the semester.
- 60-minute written or 20-minute oral examination. The specific mode of assessment will be announced by the lecturer at the start of the semester.

Registration for the presentation automatically implies a registration for any of the dates offered for written/oral examination following the same course of lectures. In order to pass this module, students must pass both partial examinations. The exam will count 80% of the grade, the oral presentation 20%.

Gesamtnotenrelevanz

Wiederholungsmöglichkeit

Bei Nichtbestehen können alle Veranstaltungen gemäß § 6 der Fachstudien- und -prüfungsordnung wiederholt werden.

Literatur

Michael Howard & David LeBlanc: Writing Secure Code, Microsoft Press, 2nd edition, 2002
Gary McGraw: Exploiting Software: How to Break Code, Addison-Wesley, February 2004

John Viega & Gary McGraw: Building Secure Software, Addison-Wesley, 2001 Mark G. Graff & Kenneth R. van Wyk: Secure Coding, O.Reilly, 2003 Brian A. La Macchia, Sebastian Lange, Matthew Lyons, Rudi Martin, and Kevin T. Price: .NET Framework Security, Addison-Wesley, 2002 L. Gong, G. Ellison, M. Dageforde: Inside Java 2 Platform Security, Addison-Wesley, 2nd Edition, 200
Weitere Hinweise

5724V Safety and Security of Critical Infrastructures

Modulnummer
5724V
Veranstaltungstitel
Safety and Security of Critical Infrastructures (ehemalig: Sicherheit in Netzen)
Modulverantwortliche*r / Prüfer*innen
Prof. Dr. Hermann de Meer

Prüfungsnummer	**ECTS**	**SWS**
451006	6	2V + 2Ü
Modulangebot	**Zeitdauer des Moduls**	**Empfohlenes Studiensemester**
Unregelmäßig /irregular	1 Semester	

Workload
60 Std. Präsenz + 50 Std. Übungen + 70 Std. Nachbearbeitung des Vorlesung und Prüfungsvorbereitung / 60 contact hours + 50 hrs exercises + 70 hrs independent study and exam preparation
Verwendbarkeit
Wirtschaftsinformatik / Information Systems
Bezug zur LPO I
Empfohlene Voraussetzungen
Grundlagen der IT-Sicherheit, Rechnernetze, Funktionale Sicherheit und Foundation of Energy Systems von Vorteil / Basics of IT Security, Computer Networks, Functional Safety and Foundation of Energy Systems advantageous
Verpflichtende Voraussetzungen
Keine / None
Unterrichtssprache
Deutsch oder Englisch / German or English

Inhalt
Das Modul beinhaltet im Bereich Netzsicherheit die Einführung in die Netzsicherheit und Sicherheitsprotokolle für Netzwerke. Weitere Inhalte sind die sichere drahtlose und mobile Kommunikation und der Bereich Sicherheit in drahtlosen Sensornetzwerken der die Punkte Einführung in die Sicherheit von Sensornetzen und Sicherheitsprotokolle in Sensornetzen umfasst. Zudem beinhaltet das Modul den Bereich Sicherheit im Smart Grid, dem zukünftigen intelligenten Stromnetz. In the network security segment, the module includes an introduction to the network security and security protocols for networks. Other topics include secure wireless and mobile communication. The security in wireless sensor networks area includes an introduction to sensor network security and security protocols in sensor networks. The module also includes the area of security for Smart Grids, the intelligent power grids of the future.

Lernergebnisse Lernziele
Kenntnisse / Skills/Knowledge: Die Studierenden lernen aktuelle und zukünftige Konzepte von Sicherheit in Netzen kennen. Sie erhalten Kenntnisse über die verschiedenen Bedrohungen und Angriffe sowie von der Konzeption und Implementierung von Sicherheitsdiensten zum Schutz des Netzes. Sie erlangen Kenntnisse über Methoden zur Gewährleistung von Sicherheitszielen wie Datenintegrität, Vertraulichkeit, Zurechenbarkeit und Verfügbarkeit. Bedrohungen wie Maskerade, Abhören von Daten, unberechtigter Zugang zu Services, Sabotage und Modifikation von Informationen können durch geeignete Sicherheitsdienste wie Authentizierungsservice oder Datenintegritätsservice ausgeschaltet werden. Students will learn about current and future concepts of security in networks. They will acquire knowledge of the various threats and attacks, as well as the design and implementation of security services for the protection of the network. They will gain knowledge of methods for ensuring security goals such as data integrity, confidentiality, accountability and availability. Threats such as masquerade, eavesdropping of data, unauthorized access to services, sabotage and modification of information can be turned off by suitable security services such as authentication services and data integrity services. Fähigkeiten / Abilities: Die Studierenden entwickeln Fertigkeiten zum Design und Entwurf von Sicherheitsmechanismen bei verdrahteten Netzen, drahtlosen Netzen, mobilen Netzen, Sensornetzen und RFID-basierten Netzen. Sie erlangen die Fähigkeit aktuelle und künftige Konzepte der Netzsicherheit zu verstehen und zu bewerten. Durch die Analyse von verschiedenen Angriffsmethoden wie z.B. DoS oder Relay-Angriffe lernen sie, wie man geeignete Gegenmaßnahmen entwirft und in welcher Schicht des Protokollstacks welche Dienste auf welche Weise implementiert werden können, um die Angriffe zu verhindern. Students will develop skills to design security mechanisms in wired networks, wireless networks, mobile networks, sensor networks and RFID-based networks. They will gain the ability to understand current and future concepts of network security and evaluate them. By analyzing various attack methods such as DoS or relay attacks they learn how to design appropriate countermeasures and in what layer of the protocol stack which services can be implemented to prevent the attacks. Kompetenzen / Competencies: Die Studierenden sind in der Lage, an Hand der Anforderungen selbstständig die erforderlichen Sicherheitsmechanismen wie Authentifizierungsprotokolle oder Datenintegritätsmechanismen zu entwerfen und zu implementieren udents will be able to understand the requirements for designing the security mechanisms such as authentication protocols and data integrity mechanisms and to implement them independently.
Lehr- und Lernformen
Präsentation und Beamer, Tafel (Labor/Rechner) / Presentation and projector, blackboard (laboratory/computer)
Anwesenheitspflicht
Prüfungsleistung (Prüfungsform, Umfang, Gewichtung)
90 Minuten Klausur / 90-minute written examination
Gesamtnotenrelevanz
Wiederholungsmöglichkeit
Bei Nichtbestehen können alle Veranstaltungen gemäß § 6 der Fachstudien- und -prüfungsordnung wiederholt werden.

Literatur
Weitere Hinweise
Yan Zhang, Security in RFID and sensor networks, Auerbach Publications, 2009, ISBN 9781420068399 G. Schaefer, Netzsicherheit, dpunkt.verlag Claudia Eckert, Christoph Krauß (2011). Sicherheit im Smart Grid: Eckpunkte für ein Energieinformationsnetz, Alcatel-Lucent-Stiftung. http://www.stiftungaktuell.de/index.php?article_ id=21&slice=364 Claudia Eckert, Christoph Krauß (2012). Sicherheit im Smart Grid: Sicherheitsarchitekturen für die Domänen Privatkunde und Verteilnetz unter Berücksichtigung der Elektromobilität, Alcatel- Lucent-Stiftung. http://www.stiftungaktuell.de/index.php?article_ id=21&slice=403

5771V Multimedia Databases

Module number
5771V
Course name
Multimedia-Datenbanken, Multimedia Databases
Module coordinator
Prof. Dr. Harald Kosch

Examination number	Credit points (ECTS)	Hours per week (SWS)
405031	7	3V + 2Ü
Availability	**Duration**	**Recommended semester**
Every summer semester	1 Semester	

Workload
75 contact hours + 50 hrs exercises + 85 hrs independent study and exam preparation
Module applicability
Wirtschaftsinformatik / Information Systems
Reference to the LPO I
Recommended prerequisites
None
Requirements
None
Language of instruction
English

Content
New media standards (here especially MPEG - MPEG-4 AVC or derived from MPEG DivX, mp3) and better recording devices in the media processing industry have been developed in recent years. New methods and tools are developed, which can manage the mass of recorded and transmitted data. The value of information largely depends on how easily the data can be searched and managed according to their Content. These multimedia databases are used exclusively. The multimedia search here differs substantially from textual search. We distinguish Content-based search, which for example is to enable color, contour, and texture based distributions for visual media and image-to- image comparisons. More accurate methods are based on a region -based search, which tries to identify parts of an image or video. The semantic search allows you to find media based on the fellow in the media persons, or places/events portrayed. A multimedia database system provides here the necessary functions for media manipulation and at the same time enables the Content-based and semantic search and that too in large amounts of data, which is made possible due to intelligent index structures. Content structure: Content -Based Indexing and Retrieval (visual media): color theory and presentation, brief overview of description of features such as texture, edges, extraction of features, retrieval systems and demos of multimedia data modeling (in XML: MPEG -7) Multimedia DBMS: Multimedia access structures, especially the family of R-trees, SS-trees and SR- Trees

Multimedia Anfrageverarbeitung and optimization Programming of multimedia DBMS Overview of common MMDB products and research prototypes
Intended learning outcomes (ILOs)
Skills/Knowledge Students will acquire knowledge of techniques for multimedia processing and extraction of descriptive multimedia features and the development of multimedia database management systems and programming of multimedia databases. Abilities Students will acquire the ability to perform practical specification of multimedia requests, implementation and optimization of multimedia queries and the use of multimedia standards. Competencies Students will acquire the competence to transfer the database knowledge on multimedia data, extensions of SQL and mastery of object-relational constructs for multimedia, technical dealing with the media, management of multimedia data in general.
Teaching methods
Slides-oriented lecture, panel use with examples, additional explanations and explanatory facts: Weekly tutorials in small groups. The presence tasks and the sample solutions are precalculated to the exercises Expected activities of students: Participation in compulsory and voluntary tutorials, independent study of secondary literature Slide script is accessible and available through Stud.IP
Required attendance
Examination (type of examination, scope)
90-minute written examination
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
Harald Kosch: “Distributed Multimedia Database TechnoloRecommended reading gies supported by MPEG-7 and MPEG-21”, CRC Press, November 2003, ISBN 0-8493-1854-8 Klaus Meyer-W egener: „Multimediale Datenbanken- Einsatz von Datenbanktechnik in Multimedia-Systemen“, 2. Auflage 2004, Teubner Verlag, ISBN 3-519-12419-X.
Additional notes

5772 Data Modelling and Data Processing in the Internet of Things

Module number
5772
Course name
Data Modelling and Data Processing in the Internet of Things
Module coordinator
Prof. Dr. Harald Kosch

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
455386	5	2V + 1Ü
Availability	**Duration**	**Recommended semester**
Every summer semester	1 semester	

Workload
30 + 15 contact hours + 105 hrs exercises, independent study and exam preparation
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
None
Requirements
None
Language of instruction
English

Content

Internet-of-Things(IoT) systems collect and aggregate sensor data from physical products. This enables control systems to be optimised, innovative services to be offered and new business models to be developed. IoT systems require an intelligent data concept and management that takes into account not only the collection and agregation but also the evaluation of sensor data.

The lecture is divided into 3 parts:

1. Introduction to IoT and different web technologies relevant for IoT systems
   - IoT Systems, such as, microcontroller
   - IoT Frameworks and Architectures (e.g., Vorto)
   - JSON, JSON Schema, RDF, JSON-LD 1.1
   - IoT Datastores, such as from IoT Cloud Systems

2. Data Modeling technologies for IoT
   - WoT Building Blocks: Thing Model, Thing Description and Binding Templates
   - Semantic Modeling (Context Extension)

3. Data processing mechanisms in IoT
   - WoT API

• Discovery • Security • Data coding • Data processing
Intended learning outcomes (ILOs)
Skills/Knowledge Students gain an understanding of the basics of current data modeling approaches and their processing in the context of the Internet of Things (IoT) domain. They are able to describe data models of participating IoT systems and apply techniques to process and interpret them, for example, to enable interaction with other IoT systems (Plug&Play). They will be familiarized with the use of standardized (semantic) web technologies in the context of the W3C Web of Things (WoT) and can describe current applications in various areas of industry, including automation, energy and transport systems through their services. Abilities Participants will be equipped to implement fundamental approaches to data modeling for Internet of Things systems. They will be able to write service descriptions for concrete questions and applications in the Web of Things. Competencies Students learn basic and practical skills in the design of IoT systems, the technology blocks of the W3C Web of Things, as well as in the application of semantic web technologies.
Teaching methods
Projector presentation
Required attendance
Examination (type of examination, scope)
90-minute written or 20-minutes oral examination; the precise mode of assessment will be announced at the start of the semester.
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
To be announced by the lecturer. The literature will be announced by the lecturer at the beginning of the lecture
Additional notes

5777 Technologien zur Wahrung der Privatsphäre in Informationssystemen / Privacy-Preservation Technologies in Information Systems

Module number
5777
Course name
Technologien zur Wahrung der Privatsphäre in Informationssystemen / Privacy-Preservation Technologies in Information Systems
Module coordinator
Prof. Dr. Harald Kosch

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
472215	5	2V + 1Ü
Availability	**Duration**	**Recommended semester**
irregular	1 semester	

Workload
30 + 15 contact hours, 105 hours of exercises, independent study and exam preparation
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
None
Requirements
None
Language of instruction
English

Content

Preserving privacy and anonymity is a topic area that is influenced by both technical and legal conditions. The lecture discusses these conditions in the context of information systems. In the first part of the lecture the basic concepts and methods are conveyed. In the second part of the lecture, different use cases in information systems with specific anonymity and privacy frameworks are detailed.

1. Basics of privacy preservation
   - Legal basis in Europe (GDPR)
   - Anonymity and privacy
   - Basics of data management in information systems
   - Privacy-preserving methods (anonymization, privacy models)
   - Tradeoff between privacy and utility

2. Use Cases
   - Medical research data
     – Hippocratic databases and purpose-based access control
     – Pseudonymization

- Data warehouse
  – Anonymization strategies
  – Query-based anonymization
- Social networks
  – Data protection requirements for social networks
  – Privacy preservation for graph data

Intended learning outcomes (ILOs)

Skills/Knowledge
The students know the core concepts of technologies used for the protection of privacy in information systems. The students also know the legal basis of data protection in Europe (GDPR), which is contrasted to the technical possibilities. The students know the differences between privacy and anonymity, know principles for attacks on privacy and anonymity and methods to protect them. The students know the special requirements in relevant use cases for information systems, such as medical information systems or data warehouses.

Abilities
The students of the course master the selection and application of suitable methods for the protection of privacy and anonymity in information systems, taking into account the specifics of the information system and legal requirements. The students are able to determine and evaluate data protection risks in information systems.

Competencies
The participants understand the basics of technical data protection, in particular methods of anonymization, pseudonymization and privacy models. The participants also understand the legal basis for data protection in Europe - the General Data Protection Regulation (GDPR). The participants can select suitable methods for different information systems and apply them taking into account the specific framework conditions.

Teaching methods

Presentation with projector

Required attendance

Examination (type of examination, scope)

90-minute written or 20-minutes oral examination; the precise mode of assessment will be announced at the start of the semester.

Overall grade relevance

Exam resit opportunities

Exam resits are detailed in § 6 of the subject-specific study and examination regulation.

Recommended reading

The literature will be announced by the lecturer at the beginning of the lecture.

Additional notes

5820 Advanced IT-Security

Module number
5820
Course name
Advanced IT-Security
Module coordinator
Prof. Dr. Joachim Posegga

Examination number	Credit points (ECTS)	Hours per week (SWS)
405390	6	3V + 1Ü
Availability	**Duration**	**Recommended semester**
Jeweils im Wintersemester	1 Semester	

Workload
60 contact hours + 40 hrs exercises + 80 hrs independent study and exam preparation
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
None
Requirements
None
Language of instruction
Englisch

Content
In the module, the following topics are treated: Introduction to IT Security, Cryptographic Basics, Confidentiality, Integrity, Availability, Authentication & Authorization, security modules; OTPs, tokens, security protocols, foundations, SSL, IPSEC, user management, access protection, security of TCP/IP services, Basic security protocols and standards; Symmetric encryption (DES, AES, etc.); Asymmetric encryption (RSA, PGP), AAA in distributed systems, Kerberos, X.509 authentication, network and Internet security, IPSec, TLS/SSL, introduction to PKI, certificates, key generation, certificate authorities, certificate revocation and CA hierarchy.
Intended learning outcomes (ILOs)
Skills/Knowledge Basic knowledge of the key concepts for the operation of secure and (mostly) distributed computing systems. These include sub-components in the areas of operating systems, communications and IT security, especially cryptographic basics including PKI, principles of network security, principles of operating system security, basic security protocols and standards, security architectures, AAA in distributed systems Abilities Students have a firm grasp of concepts from selected sub-areas, based on exercises solved by the students themselves. Furthermore, they are able to analyse the security of operating systems and networks. Students are able to select appropriate encryption methods for various applications and

implement communication mechanisms in different scenarios. Students have the ability to correctly implement encryption methods. Competencies Students are able to identify, evaluate and select concepts and architectural alternatives for communication mechanisms (services and protocols). Students are expected to be competent in the use of PKI technology in various scenarios and to be able to assess the security of symmetric and asymmetric encryption methods. Students are well-versed in security protocols and standards and are able to classify and assess security architectures. Students have learnt cooperation and teamwork in the classroom and practical computer tutorials. Students have also honed their problem-solving skills by working through the exercises in the tutorials, autonomously arriving at a solution. Students are able to systematically address the complexity and perform critical assessment of approaches and its algorithmic implementation.
Teaching methods
Presentation, projector, blackboard
Required attendance
Examination (type of examination, scope)
90-minute written examination or 15-minute oral examination, depending on the number of listeners, in English or German. The exact mode of assessment will be indicated at the beginning of the semester
Overall grade relevance
Exam resit opportunities
Recommended reading
H.-P. Gumm, M. Sommer: „Einführung in die Informatik“, 5. Auflage Oldenbourg-Verlag, München, 2002 Dieter Gollmann: Computer Security, John Wiley, 1999 W. Stallings: Cryptography and Network Security, Pearson, 2003 Niemi and Nyberg: UMTS Security, John Wiley, 2003
Additional notes

5845 Search-Based Software Engineering

Module number
5845
Course name
Search-Based Software Engineering
Module coordinator
Prof. Dr. Gordon Fraser

Examination number	Credit points (ECTS)	Hours per week (SWS)
455378	6	2V + 2Ü
Availability	**Duration**	**Recommended semester**
Every winter semester	1 semester	

Workload
60 contact hours + 120 hours exercises, independent study and exam preparation
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
Software Engineering, Programmierung I + II, SEP
Requirements
None
Language of instruction
English

Content

- Local Search
- Evolutionary Algorithms
- Multi-Objective Optimisation
- Memetic Algorithms
- Novelty Search
- Parallel Search
- Search-based Testing
- Genetic Programming
- Genetic Improvement
- Program Repair

Intended learning outcomes (ILOs)

Skills/Knowledge
Search-based software engineering (SBSE) applies metaheuristic search techniques such as genetic algorithms, simulated annealing and tabu search to software engineering problems. This course covers the theory of major classes of metaheuristic optimisation algorithms, including local search algorithms and population based optimisation (such as genetic algorithms and particle swarm

optimisation) and their application to software engineering problems across the software development lifecycle (requirements, design, planning, testing, maintenance, etc). Participants will learn the fundamental basics of meta-heuristic search, as well as essential local and population-based search algorithms and their application areas in software engineering.

Abilities
Participants know the most important meta-heuristic search algorithms and their application areas in software engineering. They will be able to implement, explain and compare relevant algorithms.

Competencies
Participants learn theoretical and practical competencies for the conception, implementation, and evaluation of search algorithms and their application to problems in software engineering. In particular, participants will be able to implement these algorithms and apply them to new problems.

Teaching methods

Presentation, projector, exercises

Required attendance

Examination (type of examination, scope)

90-minute exam or portfolio-exam. The exact mode of assessment will be announced at the start of the semester.

Overall grade relevance

Exam resit opportunities

Exam resits are detailed in § 6 of the subject-specific study and examination regulation.

Recommended reading

Will be announced in the lectures. Further reading will be announced for the individual assignments.

Additional notes

5874V IT-Sicherheitsrecht

Modulnummer
5874V
Veranstaltungstitel
IT-Sicherheitsrecht
Modulverantwortliche*r / Prüfer*innen
Prof. Schröder / Dr. Hartl

Prüfungsnummer	**ECTS**	**SWS**
222430	5	2
Modulangebot	**Zeitdauer des Moduls**	**SWS**
Jedes Wintersemester	1 Semester	

Workload
30 Std. Präsenz + 120 Std. Nachbereitung und Prüfungsvorbereitung
Verwendbarkeit
Interdisziplinäres Vertiefungsangebot
Bezug zur LPO I
Empfohlene Voraussetzungen
Keine
Verpflichtende Voraussetzungen
Keine
Unterrichtssprache
Deutsch

Inhalt
Zunächst erfolgt eine grundlegende Einführung in die Thematik des IT-Sicherheitsrechts. Dabei werden Grundfragen an den Schnittstellen von Technik und Recht sowie rechtliche Grundprinzipien vorgestellt und ergänzend die relevanten Normen und die Arbeit mit zentralen rechtlichen Konzepten (allgemeine Grundlagen des Zivilrechts und öffentlichen Rechts wie insbesondere auslegungsbedürftige Tatbestandmerkmale, Ermessen oder Formen des Verwaltungshandeln) eingeführt. Es folgen themenspezifische Blöcke immer unter Rückgriff auf eingeführten Grundlagen. Dabei werden – unter Berücksichtigung aktueller Entwicklungen und Schwerpunkte – Grundrechte und staatliches Eingriffshandeln sowie Schutzpflichten, Grundlagen des Datenschutzrechts, des technischen Datenschutzes, IT-Sicherheit im Unternehmenskontext (Modellierung der Organisation der IT-Sicherheit im Unternehmen), zivilrechtliche Themen und Cyber-Resilienz behandelt. Schließlich sind öffentlich-rechtliche Regularien und Vorgaben an den Schutz (kritischer) technischer Infrastruktur Teil der Veranstaltung. Schwerpunkt der Veranstaltung sind insgesamt, vor dem Hintergrund der genannten Themen, die mehrdimensionalen rechtlichen Anforderungen an Akteure unter dem Aspekt der IT-Sicherheit, dabei vor allem die Vermeidung rechtlicher Risiken und der Umfang rechtlicher Verantwortung auf privater Ebene sowie Auftreten und (mögliche) Regulieransätze der öffentlichen Hand.

Lernergebnisse Lernziele
Kenntnisse Die Studierenden erwerben Kenntnisse der Rechtsgrundlagen des IT-Sicherheitsrechts (verfassungsrechtliche Grundlagen und öffentlich sowie zivilrechtliche Bezüge einschließlich des Datenschutzrechts und weiterer spezialgesetzlicher Regelungen) sowie des Themenkomplexes IT-Sicherheitsrecht insgesamt aus politischer, wirtschaftlicher und technischer Perspektive; dies schließt die Kenntnis der wichtigsten höchstrichterlichen Rechtsprechung mit ein. Zudem erlangen die Studierenden Kenntnis von Fallkonstellationen, in denen technische Systeme und ihr Einsatz in der Praxis typischerweise IT-sicherheitsrechtliche Fragen aufwerfen. Fähigkeiten Die Studierenden beherrschen die Erfassung juristischer Probleme technischer Sachverhalte auf Basis der relevanten rechtlichen Grundlagen im IT-Sicherheitsrecht. Die Studierenden beherrschen die Erarbeitung von Lösungsvorschlägen für die jeweiligen rechtlichen Probleme im Themenbereich IT-Sicherheit. Kompetenzen Die Studierenden besitzen die Kompetenz zur Anwendung spezifisch juristischer Methoden der Fallbearbeitung und -lösung sowie Transferkompetenz zur Anwendung des erworbenen Wissens und der erworbenen Fähigkeiten auf die typischerweise sehr schnell auftretenden neuen Probleme des IT-Sicherheitsrechts. Sie beherrschen die Interaktion zwischen technisch und juristisch ausgebildeten Personen im beruflichen Umfeld (gegenseitige Wissensvermittlung, gemeinsame Problemlösungsstrategien).
Lehr- und Lernformen
Anwesenheitspflicht
Prüfungsleistung (Prüfungsform, Umfang, Gewichtung)
90 Minuten Klausur oder ca. 20 Minuten mündliche Prüfung, je nach Anzahl der Hörer. Die genaue Prüfungsart wird zu Beginn des Semesters bekannt gegeben.
Gesamtnotenrelevanz
Wiederholungsmöglichkeit
Gem. der Prüfungs- und Studienordnung für den Masterstudiengang.
Literatur
• Hinweise in der Vorlesung
Weitere Hinweise

5881 Privacy Enhancing Techniques

Module number
5881
Course name
Privacy Enhancing Techniques
Module coordinator
Prof. Dr. Joachim Posegga

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
405223	3	2V
Availability	**Duration**	**Recommended semester**
Every winter semester	1 semester	

Workload
30 contact hours + 60 hours Follow-up, preparing a presentation, and exam preparation
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
IT-Sicherheit, Security Insider Lab I oder II, System Security Advanced IT Security, Security Insider Lab I or II, System Security
Requirements
None
Language of instruction
English

Content
The course covers the following topics: • Attacks against privacy, including traffic analysis, deanonymization, and side-channel attacks - Systematic privacy risk assessment (for instance, using LINDDUN) • Privacy issues and privacy enhancing technologies in particular environments, like clouds or mobile devices, and for particular applications, including location-based services • Special PETs, including Trusted-computing-based PETs, privacy preserving data mining and data release • Differential privacy - Privacy-preserving software systems and applications • Relation between cryptography and privacy • Anonymous credentials • Anonymous routing and anonymity systems • Lightweight privacy-enhancing technologies for constrained environments, to provide user consent.

Intended learning outcomes (ILOs)
Skills/Knowledge Students learn key technical concepts related to privacy, both regarding the associated issues in current and emerging technologies, and the possibilities of protecting the privacy in those applications. Students learn generic principles, methods, and tools of privacy by-design (PbD) and of privacy enhancing technologies (PETs), including data anonymization and perturbation techniques. They also learn which methods are adequate for particular situations, for data release, for big data applications (in clouds, for instance), and for applications based on sensors and actuators in constrained environments. On the other hand students will learn the basic limitations of PETs. Abilities Students will develop skills in the early detection, identication, and evaluation of privacy threats and risks in existing or planned applications. In addition, they will be able to manage and respond to the risks, either suggesting modications in the functionality of the application, or selecting or developing adequate privacy-friendly solutions, and implementing and instantiating them. Competencies Students will know how to apply best practices and established technologies, such as Privacy by Design, LINDDUN. The students can explain the tradeos between privacy protection, security and functionality and to find compromises between these competing goals. They can compare the strengths and weaknesses of different PETs. The students can read and discuss the current research literature in this area.
Teaching methods
Projector, presentation and blackboard
Required attendance
Examination (type of examination, scope)
This module is assessed in partial examinations: - Oral presentation: approx 20 min. Students in small groups will present selected topics chosen during the semester. - 60-minute written or 20-minute oral examination. The specific mode of assessment will be announced by the lecturer at the start of the semester. Registration for the presentation automatically implies a registration for any of the dates offered for written/oral examination following the same course of lectures. In order to pass this module, students must pass both partial examinations. The exam will count 80% of the grade, the oral presentation 20%.
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
To be announced in the lecture
Additional notes

5942 Network Science

Module number
5942
Course name
Network Science
Module coordinator
Prof. Dr. Michael Granitzer

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
482601	5	2V + 1Ü
Availability	**Duration**	**Recommended semester**
irregular	1 semester	

Workload
45 contact hours + 105 hours exercises, preparation and follow-up
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
Data Science
Requirements
Language of instruction
English

Content

In particular, the following topics are covered:

- Basic Network Theory (Graph Types, Connectivity, Graph Traversal)
- Networks (Small World Phenomenon, Strong and Weak Ties, Information Flow, Community Detection)
- Analysing the context of social networks (Homophily and Segregation)
- Positive and Negative Relationships in Networks
- Information Networks (Structure oft he Web, Link Analysis and Web Search)
- Network Dynamics (Population Models, Information Cascades, Rich-get-richer, Cascading Behavior in Networks, Network Epidemics)

Intended learning outcomes (ILOs)

Skills/Knowledge

The students gain insights into Modeling and analysing complex real-world networks with a special emphasis on social networks. In particular knowledge on the following topics will be gained:

- Basic Graph Theory (Undirected/Directed/Bipartite Graphs, Connectivity, Graph Traversal)
- Properties of Social Networks (Strong and Weak ties, Structural Balance, Context in Social Netzworks, Small World Networks)

- Properties of Information Networks (Structure of the Web, Decentralized Search, Navigability of the Networks)
- Network Dynamics and Evolution

Abilities
The students will be able to analyse complex real-world networks and draw conclusions on their structural properties and dynamics. They will be able to develop and apply different algorithms for analysing networks, like for example clustering algorithms for detecting sub-structures and traversal algorithms for estimating statistical properties (e.g. centrality, clustering coefficient). Furthermore, students will be able to interpret the outcome of the algorithms in terms of underlying social theories, like for example Triadic Closure or Structural Balance Theory.

Competencies
Students aquire the competencies to analyse network data especially in web-based information systems and use this analysis to understand and refine those information systems.

Teaching methods

Blackboard, projector

Required attendance

Examination (type of examination, scope)

90-minute written or 20-minute oral examination. The mode of assessment will be announced at the start of the semester.

Overall grade relevance

Exam resit opportunities

Exam resits are detailed in § 6 of the subject-specific study and examination regulation.

Recommended reading

- Networks, Crowds, and Markets: Reasoning About a Highly Connected World von David Easley und Jon Kleinberg von Cambridge University Press
- Barabási, Albert-László. Network science. Cambridge University Press, 2016.
- Mark Newman, Networks: An Introduction. Oxford University Press, 2010

Additional notes

5945 Advanced Topics in Data Science

Module number
5945
Course name
Advanced Topics in Data Science
Module coordinator
Prof. Dr. Michael Granitzer

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
482603	5	2V + 1Ü
Availability	**Duration**	**Recommended semester**
Irregular	1 semester	

Workload
45 contact hours + 105 hrs exercises, preparation and followup
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
Data Science
Requirements
None
Language of instruction
English

Content

The following topics will be covered:

- Natural Computing
- Deep Neural Networks
- Representational Learning with Deep Networks including Autoencoder Networks (Denoising, Variational, Sparse), Hopfield Networks, Boltzmann Machines
- (Deep) Convolutional Neural Networks
- Recurrent Neural Networks
- Deep Residual Networks
- Deep Reinforcement Learning
- Selected Application Areas

Intended learning outcomes (ILOs)

Skills/Knowledge

The students will engage advanced topics and recent developments in the field of data science. Special emphasize will be placed on natural computing techniques, like genetic algorithms and deep

neural networks, as well as on reinforcement learning. The students will obtain in-depth knowledge on the particular algorithms and application areas (with focus web-based information systems). Abilities The students will be able to implement data analytical algorithms, in particular deep neural network and reinforcement learning approaches. They will be able to run advanced experiments on large data sets. Competencies The students will obtain the competencies to utilize recent data analytical methods, like deep learning, for analysing large data sets from web-based information systems (e.g. social media). Students will be enabled to setup experiments, conduct and evaluate them properly.
Teaching methods
Blackboard, projector
Required attendance
Examination (type of examination, scope)
90-minute examination or 20-minute oral examination. The precise mode of assessment will be announced at the start of the semester
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
Own Lecture Notes and selected publications. Literature will be announced depending on the concrete topics
Additional notes

5970V Scaling Database Systems

Module number
5970
Course name
Scaling Database Systems
Module coordinator
Prof. Dr. Stefanie Scherzinger

Examination number	Credit points (ECTS)	Hours per week (SWS)
451016	6	2V + 2Ü
Availability	**Duration**	**Recommended semester**
Every winter semester	1 Semester	

Workload
60 contact hours + 45 hrs exercises + 75 hrs independent study and exam preparation
Module applicability
Wirtschaftsinformatik/ Information Systems
reference to the LPO I
Recommended prerequisites
Programming skills, fundamentals of databases and information systems (DBIS I + II)
Requirements
None
Language of instruction
English

Content

- Managing large amounts of data in BigTable-based systems such as Hadoop File System (HDFS).
- Processing large amounts of data in MapReduce-based systems such as Hadoop.
- Optimized evaluation of SQL queries on large volumes of data (as done in Hive and Spark).

Intended learning outcomes (ILOs)

Skills / Knowledge

The students understand the importance of scalability when managing large amounts of data. They understand about strengths and limitations of NoSQL data stores and how database systems architecture enables performance.

Abilities

The students are able to map a specific data management problem to a suitable NoSQL database management system.

Competencies The students have the competence to design their own optimizations for data management systems and implement them.
Teaching methods
Flipped classroom (videos for self-study, in-class exercises), programming project (Python).
Required attendance
Examination (type of examination, scope)
Part 1: Individual Programming project “miniHive” in Python Part 2: 60-minute written examination
Overall grade relevance
The points for the final grade are computed as follows: 30% from part 1, 70% from part 2.
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
Peter Bailis, Joseph M. Hellerstein, Michael Stonebraker, (editors), Readings in Database Systems, 5 th edition. Anand Rajaraman, Jeffrey Ullman: Mining of Massive Datasets, Cambridge University Press, 2020. Martin Kleppmann: Designing Data-Intensive Applications, O’Reilly, 2017. Stefanie Scherzinger, Build your own SQL-on-Hadoop Query Engine: A Report on a Term Project in a Master-level Database Course, SIGMOD Record, June 2019
Additional notes

5973 SQL for Data Science

Module number
5973
Course name
SQL for Data Science
Module coordinator
Prof. Dr. Stefanie Scherzinger

Examination number	Credit points (ECTS)	Hours per week (SWS)
451016	6	2V + 2Ü
Availability	**Duration**	**Recommended semester**
Irregular	1 Semester	

Workload
60 contact hours + 60 hrs exercises + 60 hrs independent study and exam preparation
Module applicability
Wirtschaftsinformatik/ Information Systems
reference to the LPO I
Recommended prerequisites
Programming skills, fundamentals of databases and information systems (DBIS I + II)
Requirements
None
Language of instruction
English

Content
This advanced database class offers a comprehensive understanding of the data life cycle and the potential of SQL in various data analysis tasks. Students explore topics ranging from data loading and cleaning to pre-processing, while mastering relational databases and handling non-traditional data formats such as XML and text. Integration with programming languages like R and Python further enriches students' abilities, enabling seamless interaction with databases and enhancing data analysis workflows. Practical exercises and hands-on experience with MySQL and Postgres databases solidify students' competencies, equipping them with the essential skills to excel in data science and database management roles
Intended learning outcomes (ILOs)
Skills / Knowledge SQL proficiency within the context of data science; Understanding of the data life cycle; Handling non-traditional data formats like XML and text; Integration of SQL with programming languages Abilities Perform data analysis tasks using SQL; Write efficient SQL queries, avoid SQL anit-patterns; Understand and navigate the data life cycle; Handle diverse data formats for analysis; Utilize SQL in conjunction with R and Python for enhanced data analysis capabilities

Competencies Proficiency in SQL for data science applications; Competence in data loading, cleaning, and pre-processing; Ability to apply SQL queries for data exploration, cleaning, and transformation; Capability to integrate SQL with programming languages for enhanced data analysis workflows
Teaching methods
Presentation and projector, worksheets
Required attendance
Examination (type of examination, scope)
60-minute written examination
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
Antonio Badia: SQL for Data Science - Data Cleaning, Wrangling and Analytics with Relational Databases. Springer 2020 Bill Karwin: SQL Antipatterns. Pragmatic Programmers, LLC, 2017 Raghu Ramakrishnan, Johannes Gehrke: Database Management Systems. McGraw-Hill, 3rd edition, 2020
Additional notes

6061 Introduction to Deep Learning

Module number
6061
Course name
Introduction to Deep Learning
Module coordinator
Prof. Dr. Florian Lemmerich

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
471616	6	2V + 2Ü
Availability	**Duration**	**Recommended semester**
Irregular	1 semester	

Workload
60 contact hours + 120 hrs independent study and implementation
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
Advanced Topics in Data Science or Introduction to AI Engineering, Python Programming Language
Requirements
None
Language of instruction
English

Content

The course will give an overview on the fundamentals and current approaches for deep learning and its main applications fields. In particular, it will cover:

- Basics of Representation Learning
- Perceptron Learning
- Feedforward Neural Networks
- Gradient Descent and Backpropagation
- Regularization in Deep Learning
- Convolutional Neural Networks
- Recurrent Neural Networks
- Autoencoders
- Adversarial Training
- Graph Neural Networks
- Applications of Deep Learning for Text, Sequences, and Images
- Explainability and Deep Learning

Intended learning outcomes (ILOs)
Skills/Knowledge Students will get to know about fundamentals of artificial neural networks, gain an overview on standard algorithms in the field as well as examples of recently proposed state-of-the-art techniques. Furthermore, students will get to know some standard tools to develop and apply deep learning techniques to machine learning problems. Abilities The students will be able to implement deep learning approaches to practical machine learning problems. They obtain the ability to choose and improve neural network architectures suitable for specific machine learning tasks. Competencies Students will strengthen their competence to analyze and assess algorithms for machine learning. Participants will learn to develop problem-oriented solutions with deep learning approaches independently.
Teaching methods
Presentation with beamer, whiteboard
Required attendance
Examination (type of examination, scope)
• 90 minutes written or 20 minutes oral exam depending on the number of participants. • The students will be informed about the exact type of exam by the beginning of the semester
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
• Goodfellow, Ian, Yoshua Bengio, and Aaron Courville: Deep Recommended reading learning. MIT press, 2016 • Aggarwal, Charu C.: Neural networks and deep learning. Springer 10 (2018): 978-3 • Additional literature will be announced at the beginning of the semester
Additional notes
Notice: Replacing Deep Learning, cannot be credited twice.

6064 Responsible Machine Learning

Module number
6064
Course name
Responsible Machine Learning
Module coordinator
Prof. Dr. Florian Lemmerich

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
471617	6	2V + 2Ü
Availability	**Duration**	**Recommended semester**
Every summer semester	1 semester	

Workload
60 contact hours + 120 h independent study and implementation
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
Advanced Topics in Data Science and/or Introduction to AI Engineering, Python Programming Language
Requirements
None
Language of instruction
English

Content
The course will give an overview on the main challenges and current approaches for responsible machine learning. This module will focus on explainable and interpretable approaches to machine learning, specifically for classification. It will discuss the relevancy of interpretability and will introduce white-box learning algorithms (e.g., decision tree learning, rule-based classification and simple regression models) and methods to explain black-box solutions (e.g., LIME, counterfactual explanations). The course will also cover the challenges of biases and fairness in machine learning, and will cover how these can be measured at an individual or at a group level. Students will also get to know about algorithms to counteract such biases with pre-, in-, or post-processing methods. In addition, the course will also provide an overview and introduce key approaches of privacy-aware machine learning, and reproducibility issues in machine learning.
Intended learning outcomes (ILOs)
Skills/Knowledge Students will get to know about the main aspects of applying machine learning responsibly in sensitive settings, e.g., when working with behavioral data. This covers the problem settings, challenges, and main algorithmic approaches for ex plainable, fair, privacy-aware, and reliable machine learning.

Abilities
The students will be able to identify potential issues of machine learning and artificial intelligence applications and apply appropriate measures to address them. Students will improve their ability to assess, select and implement solutions for machine learning tasks, specifically when working with data from or about human behavior.

Competencies
Students will strengthen their awareness with respect to algorithmic transparency, fairness, privacy, and reliability. They will improve their competence to critically assess artificial intelligence approaches with sensitive data. Participants will learn to develop problem-oriented machine learning solutions for sensitive data independently.

Teaching methods

Presentation projector, whiteboard

Required attendance

Examination (type of examination, scope)

90-minute written or 20-minute oral examination depending on the number of participants. The students will be informed about the exact type of exam by the beginning of the semester.

Overall grade relevance

Exam resit opportunities

Exam resits are detailed in § 6 of the subject-specific study and examination regulation.

Recommended reading

- Molnar, Christoph: Interpretable machine learning, 2nd edition, 2020. Online book available at https://christophm.github.io/interpretable-ml-book/.
- Solon Barocas, Moritz Hardt, Arvind Narayanan: Fairness and Machine learning - Limitations and Opportunities, 2017. Online book available at https://fairmlbook.org/pdf/fairmlbook.pdf
- Additional literature can be announced at the beginning of the semester.

Additional notes

6090 Security of Computer and Embedded Systems / Sicherheit von Rechnern und eingebetteten Systemen

Module number
6090
Course name
Security of Computer and Embedded Systems / Sicherheit von Rechnern und eingebetteten Systemen
Module coordinator
Prof. Dr. Elif Bilge Kavun

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
455385	5	2V + 1Ü
Availability	**Duration**	**Recommended semester**
Every winter semester	1 semester	

Workload
45 contact hours + 50 hrs exercises + 55 hrs independent study and exam preparation
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
None
Requirements
None
Language of instruction
English

Content
This module provides an introduction into computer security and embedded security. In particular, this module focuses on approaches and techniques for building secure systems and for the secure operation of systems. The module requires an understanding of mathematical concepts (e.g., modulo-arithmetic, complex numbers, group theory) and logic (set theory, predicate logic, natural deduction). Moreover, the module requires an understanding of a programming language (e.g., Python, C) and basic software engineering knowledge. Some exercises require a basic command of Linux in general and the command line (shell) in particular. The module includes the topics: • Computer Security Fundamentals • Access Control • Embedded Systems • Need for Security in Embedded Systems • Cryptographic Foundations • Attacking Crypto • Public Key Infrastructures (PKIs)

- Digital Signatures
- Security Protocols
- Formal Analysis of Security Protocols
- Secure Software Development Lifecycle (SSDL)
- Threat Modelling
- Common Vulnerability Scoring System (CVSS)
- Software Vulnerabilities
- Secure Programming
- Security Testing: Basics, Fuzzing, Static Analysis
- Security of Third-Party Components
- RFID Security
- Hardware Fingerprinting & IC Security

Intended learning outcomes (ILOs)

Skills/Knowledge
Students get to know

- the complexity of the security landscape,
- the potential vulnerabilities associated, e.g., authentication, data integrity,
- the advantages and disadvantages different information security principles,
- understand the risks of security vulnerabilities.

Abilities
Students practice a detailed understanding of industrially relevant issues relating to computer security and embedded security as well as the ability to present material in a concise yet comprehensive manner and to target that material appropriately to the audience in question.

Competencies
The students gain awareness on the different types of computer attacks and their effect on data security and privacy, get an understanding of the fundamental principles of information security and get some practical knowledge of how these principles and implementing technologies can be used to ensure better data and system security.

Teaching methods

Presentation and projector, blackboard

Required attendance

Examination (type of examination, scope)

Written exam (90 minutes) or oral exam in English according to the number of participants (about 20 minutes); the precise mode of assessment will be announced at the start of the semester.

Overall grade relevance

Exam resit opportunities

Exam resits are detailed in § 6 of the subject-specific study and examination regulation.

Recommended reading

- J. Gersting. Mathematical Structures for Computer Science. WH Freeman, 7th edition, 2016.
- R. J. Anderson. Security Engineering: A Guide to Building Dependable Distributed Systems. John Wiley & Sons Inc., 1st edition, 2001.
- A. J. Menezes, S. A. Vanstone, and P. C. V. Oorschot. Handbook of Applied Cryptography. CRC Press Inc., 5th edition, 2001.
- M. Howard, D. LeBlanc, and J. Viega. 24 Deadly Sins of Software Security: Programming Flaws and How to Fix Them. McGraw-Hill Inc., 1st edition, 2010.

AND • Online resources will be provided and specific readings will be announced during the lectures and exercise sessions.
Additional notes

6120 Principles of AI Engineering

Module number
6120
Course name
Principles of AI Engineering
Module coordinator
Prof. Dr. Steffen Herbold

Examination number	Credit points (ECTS)	Hours per week (SWS)
455410	6	2V + 2Ü
Availability	**Duration**	**Recommended semester**
Irregular	1 semester	

Workload
60 contact hours + 45 hrs exercises + 75 hrs independent study and exam preparation
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
Software Engineering, Introduction to AI Engineering
Requirements
None
Language of instruction
English

Content
This module covers the following topics: • Requirements engineering for systems with AI components • Architecture and design of systems with AI components • AI/ML pipelines • Testing of AI components • Data quality • Continuous deployment and MLOps • Responsible development of AIs • Ethical and regulatory aspects
Intended learning outcomes (ILOs)
Skills/Knowledge: The students know the terminology and methods for the development of applications with components powered by Artificial Intelligence (AI) and how they can be used in operation. They know how to define requirements for AI systems, can de□ne and implement suitable architectures, and ensure their quality of such systems. They can assess non-functional aspects of AI systems to ensure a responsible, ethical, and regulatory compliant use.

Teaching methods
Presentation with a projector, blackboard
Required attendance
Examination (type of examination, scope)
Portfolio: Implementation of a semester project completed with a presentation of approximately 10 minutes duration and a 2 page written report featuring a demonstration of results at the end of the semester. A 60-minute written or oral examination of approximately 15 minutes duration conducted either in German or English. The form of assessment is announced at the beginning of the semester.
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
Will be announced at the beginning of the lecture
Additional notes

6123 Deep Learning for Natural Language and Code

Module number
6123
Course name
Deep Learning for Natural Language and Code
Module coordinator
Prof. Dr. Steffen Herbold

Examination number	Credit points (ECTS)	Hours per week (SWS)
472700	6	2V + 2Ü
Availability	**Duration**	**Recommended semester**
Irregular	1 semester	

Workload
60 contact hours + 45 hrs exercises + 75 hrs independent study and exam preparation
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
Introduction to Deep Learning
Requirements
None
Language of instruction
English

Content
This module covers the following topics: • Typical tasks for language and code processing • Word embeddings and recurrent neural networks • Transformers and pre-training • Encoder-only models • Decoder-only models • Encoder-decoder models • Encoder-decoder models • Domain-specific models • Embeddings for code • Transformers for code • Multimodal models
Intended learning outcomes (ILOs)
Skills/Knowledge: The students know the typical tasks that can be solved through natural language and code processing. They know modern deep learning approaches to address these tasks and know how to

implement them in practice. They know how select suitable methods for a given problem. They know the limitations of the models and can evaluate their performance.
Teaching methods
Presentation with a projector, blackboard
Required attendance
Examination (type of examination, scope)
90-minute written or 20-minutes oral examination; the precise mode of assessment will be announced at the start of the semester.
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
Will be announced at the beginning of the lecture
Additional notes

6206 Data on the Web

Module number
6206
Course name
Data on the Web
Module coordinator
Prof. Dr. Stefanie Scherzinger

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
455417	6	2V + 2Ü
Availability	**Duration**	**Recommended semester**
Irregular	1 semester	

Workload
60 contact hours + 60 hrs exercises + 60 hrs independent study and exam preparation
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
Databases and Information Systems, Algorithms and Data Structures, Web and Data Engineering
Requirements
None
Language of instruction
English

Content
This module focuses on the principles of sharing data on the web through REST and Linked Open Data APIs. It shows suitable data formats for publishing data on the web, explains the role of ontologies and data vocabularies in improving data interoperability, and presents how to consume data using the SPARQL query language.
Intended learning outcomes (ILOs)
Skills/Knowledge: The students acquire a systematic understanding of publishing and sharing data on the web. They know basic and advanced models and formats for representing data on the web as knowledge graphs, the principles for achieving data interoperability through ontologies, and advanced technologies for querying the data. Abilities: The students can identify, understand, and access/query data published on the web (REST, SPARQL). They can also publish their data in an interoperable way exploiting existing and designing their ontologies to describe the data. They can combine data from different data sources into a single knowledge graph and query it.

Competencies: The students have the competence to select appropriate technologies for publishing and consuming data on the web, design ontologies to describe the data, and design and execute queries (SPARQL) on top of the data.
Teaching methods
Lectures, presentation and demonstrations with a projector, blackboard, practical seminar, demonstrations with a projector, students work on exercises using their own laptops
Required attendance
Examination (type of examination, scope)
• Part 1: At least 50% of points from small practical assignments from the labs, i.e., work with the particular systems. Can be done during the exercises or as homework. Not a part of the final grading. • Part 2: A graded 60-minute written examination of terminology and theoretical principles. The points for the final grade are computed as follows: Part 1 is pass/fail, and must be passed. Part 2 is graded.
Overall grade relevance
Exam resit opportunities
Exam resits are detailed in § 6 of the subject-specific study and examination regulation.
Recommended reading
• Tom Heath and Christian Bizer. Linked Data: Evolving the Web into a Global Data Space. Synthesis Lectures on the Semantic Web: Theory and Technology, Morgan & Claypool. 2011 • Bob DuCharme. Learning SPARQL: Querying and Updating with SPARQL 1.1. O'Reilly Media, Inc. 2013 • Panos Alexopoulos. Semantic Modeling for Data. O'Reilly Media, Inc. 2020 • Mayank Kejriwal, Craig A. Knoblock, Pedro Szekely. Knowledge Graphs (Adaptive Computation and Machine Learning series). MIT Press. 2021
Additional notes

6210 Semantic Data Integration

Module number
6210
Course name
Semantic Data Integration
Module coordinator
Prof. Dr. Alsayed Algergawy

Examination number	**Credit points (ECTS)**	**Hours per week (SWS)**
473270	6	2V + 2Ü
Availability	**Duration**	**Recommended semester**
irregular	1 semester	

Workload
60 contact hours + 60 hrs exercises + 60 hrs independent study and exam preparation
Module applicability
Wirtschaftsinformatik/ Information Systems
Reference to the LPO I
Recommended prerequisites
Databases and Information Systems, Algorithms and Data Structures, Web and Data Engineering
Requirements
None
Language of instruction
English

Content
This module focuses on the principles of data integration describing the importance of data integration in different applications and use cases. Different schemes of integration such virtual and physical data integration will be covered. The course will further focus on virtual and web data integration. Further topics covered are various aspects of data integration, such as data and semantic heterogeneities, schema and ontology matching, and the role of semantics and ontologies in improving data integration and data interoperability
Intended learning outcomes (ILOs)
Skills/Knowledge The students acquire a systematic understanding how to combine and integrate different data sources using a broad range of techniques for data integration. During the integration process, the students will know basic and advanced models and formats for representing data, how to identify and discover data and semantic heterogeneities across different data sources, the principles for achieving data interoperability through ontologies, and advanced technologies for querying the data Abilities The students can identify, understand, and access/query different data sources (conjunctive queries, XQuery, and SPARQL). They can also identify and discover different heterogeneities across data sources, how to resolve these kinds of heterogeneities through schema and ontology matching.

They can combine data from different data sources into a mediated schema making use of discovered matches and query it.

Competencies
The students obtain the competency to select appropriate technologies for identifying and discovering data and semantic heterogeneities through schema and ontology matching, design ontologies to describe the data, and design and execute queries on top of the data.

Teaching methods

Lectures, presentation and demonstrations with a projector, blackboard, practical seminar, demonstrations with a projector, students work on exercises using their own laptops

Required attendance

Examination (type of examination, scope)

90-minute written examination

Overall grade relevance

Exam resit opportunities

Exam resits are detailed in § 6 of the subject-specific study and examination regulation.

Recommended reading

- AnHai Doan, Alon Halevy, Zachary Ives: Principles of Data Integration. Morgan Kaufmann, 2012.
- Barbella, Marcello, and Genoveffa Tortora. Ä Semi-automatic Data Integration Process of heterogeneous databases." Pattern Recognition Letters (2023).
- Ulf Leser, Felix Naumann: Informationsintegration. Dpunkt Verlag, 2007.
- Luna Dong, Divesh Srivastava: Big Data Integration. Morgan & Claypool, 2015.
- Serge Abiteboul, et al: Web Data Management. Cambridge University Press, 2012.
- Mountantonakis, Michalis, and Yannis Tzitzikas. "Large-scale semantic integration of linked data: A survey." ACM Computing Surveys (CSUR) 52.5 (2019): 1-40.
- Jérôme Euzenat, Pavel Shvaiko: Ontology Matching. Springer, 2007.
- Felix Naumann: An Introduction to Duplicate Detection. Morgan & Claypool, 2012.

Additional notes