Programme Specifications

Premaster's Computing – PMIT4

October 2024

Progression Degrees

MSc Applied Data Science & Analytics
MSc Applied Computer Science
MSc Computer Science - Cyber Security
MSc Computer Science - Big Data & AI

Foundation Overview

Duration	1 Semesters (14 teaching weeks)
Occurrence	October, April
Total teaching hours face to face	364
Total study hours	586
Language	English

Premaster's Modules

	Modules	**Codes**
1	English language and Academic skills	PG01
2	Principles of Programming and Software Engineering	PG06
3	Analytical Techniques	PG05
4	Research Design and Communication	PG02
5	German language and culture	GL01 GL02*

*German conversation – optional after progression

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Name of Module/ Modultitel: *Advanced English Language and Academic Skills*					
Course Information/ Kursinformationen	**Frequency of delivery/ Häufigkeit des Angebots**	**Length/ Dauer**	**Language/ Sprache**	**ECTS points/ ECTS-Punkte**	**Study hours/ Studentische Arbeitsbelastung**
PG01 Advanced English Language and Academic Skills	Annually	1 Semester	English		Total study hours: 300 Taught hours: 112 Self-study: 188
Module Leader/ Modulverantwortliche(r)/ Lehrende	**Credits/ Leistungspunkte**	**Assessment/ Prüfungsform**		**Teaching mode and methods/ Lehr- und Lernformen**	**Weighting/ Prüfungsleistung**
		1. Written Assessment (report (1000 words) 2. Formative assessment: Reflection on Academic Writing Skills 3. Group Presentation and Seminar Discussion (10 mins each) 4. Examination covering academic reading and listening skills (2hrs)		Lectures, Seminars, Tutorials, Group work	1. Course work 40% 2. Course work 40% 3. Exam 20%

Module Description/ Constructive Alignment

This module has been designed to help students develop their academic literacy and communication skills in preparation for undergraduate study and to understand the institutional culture, practices, norms and expectations of German higher education in an international academic context and community. It will enable students to develop academic research and communication skills using contemporary resources and raise students' English language levels to the required entry point for undergraduate entry. It also aims to provide students with understanding of the range of methodologies and a solid grounding for the research skills required in undergraduate study. By encouraging students to share this knowledge in an open class forum (small group tutorial presentations), the module also aims to develop and encourage the use of presentation skills in academic and professional-facing contexts.

At the end of this Module, students will have developed transferable and portable skills of effective and professional communication to support their ongoing study as well as providing a basis to foster career and life-building skills. The module utilises several practical activities to allow candidates to develop these essential skills. Assignments for each of the four skills of academic reading, writing, speaking and listening are included to confirm that students meet the appropriate exit threshold in English language proficiency.

Intended Learning Outcomes – Ability to act /transferrable skills / Handlungskompetenz

Upon completion of this module students will be able to:

- Demonstrate an ability to communicate effectively, both orally and in writing, qualitative and quantitative information at an appropriate level
- Embed the importance of self-study and reliance. This involves cultivating and developing a responsibility within each student to take responsibility for their own learning, initiative, effective time-management and self-discipline within the academic and professional environments

- Demonstrate awareness of the need to function as reflective autonomous learners in a variety of environments, work in teams in a variety of roles, forming, leading, building, problem solving and consolidating, and manage time and tasks effectively
- Display an understanding of the concept of continuous improvement and objectivity in relation to an individual's academic performance

Intended Learning Outcomes - Knowledge and subject specific understanding / Fachkompetenz

Upon completion of this module students will be able to:

- Demonstrate an ability to structure and produce an academic essay or report on a topic relevant to the student's discipline, including the planning, writing and editing stages of the process
- Develop and practise academic writing skills at the sentence, paragraph and discourse levels in appropriate written genres
- Be able to construct arguments with supporting evidence to establish a position on an issue
- Interpret, summarise and evaluate arguments, assumptions, data and concepts to make justified decisions or draw justified conclusions

Intended Learning Outcomes – Application and generation of knowledge / Methodenkompetenz

Upon completion of this module students will be able to:

- Search for, select and evaluate sources of information for research, and use appropriate citation and bibliography writing conventions, making full use of library and e-learning search (catalogue and bibliographic) resources
- Demonstrate an ability to understand and identify the key themes of a lecture, using appropriate comprehension, notetaking and summary writing skills
- Select, read, digest, summarise and synthesise information material in a variety of forms, both qualitative and quantitative (text, numerical data and diagrammatic) and in an appropriate manner to identify and determine key facts/themes and relevance.
- Analyse and incorporate appropriate academic sources and data into academic writing
- Understand the principles and conventions of academic discourse including using sources correctly and avoiding plagiarism
- Proficiently use techniques and technology in the collation, interpretation and presentation of data in oral and written formats
- Build examination techniques and skills

Intended Learning Outcomes – Communication and cooperation / Sozialkompetenz

Upon completion of this module students will be able to:

- Work effectively as a team member and independently
- Plan and deliver a formal academic presentation to a group of peers on a topic relevant to the student's discipline

Outline Content/ Lerninhalt

- **Academic writing conventions** - preparation for and production of academic written assignments in genres relevant to the discipline of study: argumentation, paragraph structure and cohesion, and introduction and practice of appropriate academic grammar and vocabulary to encourage greater linguistic accuracy.

- **Referencing & Plagiarism** – introduction and practise of referencing techniques and tackling plagiarism and use of AI generated text through paraphrasing, reporting verbs and transition signals

- **Reading techniques** - development of reading strategies including reading for different specific purposes, identifying main points and topic sentences, predicting content of reading passages; note-taking and summarising content and evaluating writers' purpose and stance

- **Presentations & Seminars** - Preparation for and planning of academic presentations and participation in seminars: fluency development in spoken academic language, development of verbal and non-verbal communication skills, use of visual aids and techniques of engaging with audience. Developing of interpersonal skills for successful groupwork

- **Listening and note-taking** - developing comprehension skills for listening to authentic lectures and other academic spoken formats. Introduction and development of academic notetaking and summary strategies and skills for listening to lectures

- **Effective Study Techniques** - development of the micro-skills needed for academic writing, including pre-writing, brainstorming, planning, text organisation, editing and rewriting; using drafts and formative peer and tutor feedback to feedforward; selecting and using research from multiple sources in writing; and developing referencing skills.

- **Self-reflection** – helps students to think about feedback provided on their own work and learning where individual improvements can be gained through further study

Recommended reading/ Empfehlungsliteratur

Name of Module/ Modultitel: *Principles of Programming and Software Engineering*					
Course Information/ Kursinformationen	**Frequency of delivery/ Häufigkeit des Angebots**	**Length/ Dauer**	**Language/ Sprache**	**ECTS points/ ECTS-Punkte**	**Study hours/ Studentische Arbeitsbelastung**
PG06 Principles of Programming and Software Engineering	Annually	1 Semester	English		Total study hours: 150 Taught hours: 56 Self-study: 94
Module Leader/ Modulverantwortliche(r)/ Lehrende	**Credits/ Leistungspunkte**	**Assessment/ Prüfungsform**		**Teaching mode and methods/ Lehr- und Lernformen**	**Prüfungsleistung**
TBC		1. Exam includes MCQ and Coding (2 hours) 2. Final Application project with a Report of 500 words		Lecture, Seminar, Student-Managed Learning	1. Exam: 60% 2. Course work: 40%
Module Description/ Constructive Alignment					
This module has been designed to provide the basis for further study of programming and software engineering. Students will learn basics of programming (Python), delve into more advanced topics and conclude in a final project that integrates all learned skills. Successful completion of this module indicates that students have obtained a good understanding of, and ability to, apply the requisite conceptual programming knowledge and Software development skills. A diverse set of assessments will demonstrate problem-solving skills to consolidate links between knowledge gained in programming and software engineering theory and its practical, real-world contexts.					

Intended Learning Outcomes – Ability to act/ Transferable skills / Handlungskompetenz
Upon completion of this module, students will be able to demonstrate their ability to apply programming techniques in technology, software engineering and environmental contexts that can serve them well in their future studies and careers.
Intended Learning Outcomes - Knowledge and subject specific understanding / Fachkompetenz
Upon completion of this module students will be able to: • Recall and describe the key concepts of programming and how it is used and contributes to both the engineering process and solving engineering problems • Demonstrate ability to be proficient in version control with Git, understand the software development lifecycle, and be able to design, implement, and test software solutions, culminating in a final project that integrates these skills.
Intended Learning Outcomes – Application and generation of knowledge / Methodenkompetenz
Upon completion of this module students will be able to: • Design and develop software using core programming principles and data structures. • Write and manage effective code with best practices in modular design and debugging. • Use Git for version control and collaborative development. • Apply web development and database knowledge to create functional applications. • Complete a final project that demonstrates integrated skills and practical application.
Intended Learning Outcomes – Communication and cooperation / Sozialkompetenz
• Communicate technical concepts and project progress clearly to team members and stakeholders. • Collaborate effectively in a team setting, utilizing version control systems to manage contributions and resolve conflicts. • Present project work professionally, demonstrating the ability to explain design decisions and technical solutions.
Outline Content/ Lerninhalt
• Introduction and Basics • Control Structures • Functions and Modules • Data Structures • Object-Oriented Programming (OOP) • Introduction to GIT • Software Development Lifecycle (SDLC) • Software Design Principles • Version Control Systems

- Testing and Debugging
- Web Development Basics
- Databases and SQL
- Software Engineering Tools and Practices
- Final Project and Review

Recommended reading/ Empfehlungsliteratur

Name of Module/ Modultitel: *Analytical Techniques*					
Course Information/ Kursinformationen	**Frequency of delivery/ Häufigkeit des Angebots**	**Length/ Dauer**	**Language/ Sprache**	**ECTS points/ ECTS-Punkte**	**Study hours/ Studentische Arbeitsbelastung**
PG05 Analytical Techniques	Annually	1 Semester	English		Total study hours: 150 Taught hours: 56 Self-Study: 94
Module Leader/ Modulverantwortliche(r)/ Lehrende	**Credits/ Leistungspunkte**	**Assessment/ Prüfungsform**		**Teaching mode and methods/ Lehr- und Lernformen**	**Prüfungsleistung**
		1. Exam(closed book) with multiple choice and short-form answer questions (1 hour) 2. Final exam (closed book) (2 hours)		Lecture, Seminar, Group work, Problem based learning	1. Exam: 40% 2. Exam: 60%

Module Description/ Constructive Alignment

This module provides an introduction to the fundamental analytical techniques essential for studies in engineering and computing. Students will learn how to use a range of techniques to answer mathematical and statistical problems, thereby building the technical foundation for future Master's level studies. During this module, students will learn how to apply calculus, linear algebra and probability, in real-world scenarios. The aim is for students to develop strong problem-solving and quantitative analysis skills, enabling them to tackle complex challenges in their respective fields of study. Written Exams provide a clear, structured way to elevate a student's comprehensive knowledge, logical reasoning and accuracy in Mathematical Computations. . In class examinations will be used to allow students to fully explore mathematical language and applications.

Intended Learning Outcomes – Ability to act/ Transferable skills / Handlungskompetenz

Upon completion of this module, students will learn to critically evaluate and apply various analytical techniques, communicate technical information clearly and work effectively in teams. Additionally, students will gain data literacy, adapt to new tools and methods, and manage their time efficiently, equipping them with transferable skills that are applicable across multiple disciplines and professional environments.

Intended Learning Outcomes - Knowledge and subject specific understanding / Fachkompetenz

Upon completion of this module students will be able to:

- Apply core mathematical and statistical concepts, such as calculus and probability, to solve engineering and IT problems.
- Utilize numerical methods, differential equations, and basic machine learning to model and analyse complex systems and data.

Intended Learning Outcomes – Application and generation of knowledge / Methodenkompetenz
Upon completion of this module students will be able to: • Effectively apply analytical techniques and models to real-world engineering and IT problems, generating practical solutions • Develop and implement new methods or improvements based on mathematical and statistical analysis to enhance system performance and data interpretation.
Intended Learning Outcomes – Communication and cooperation / Sozialkompetenz
Upon completion of this module students will be able to: • Communicate complex analytical concepts and results clearly to both technical and non-technical audiences. • Collaborate effectively with peers to solve problems and complete projects, leveraging teamwork and shared expertise.
Outline Content/ Lerninhalt
• Introduction to Analytical Techniques • Fundamental of Calculus • Linear Algebra – Matrices and Determinants • Vectors • Integration • Basic of Probability • Statistics • Numerical Methods • Differential Equations • Statistical Modelling and Regression Analysis • Data Modelling • Introduction to Machine Learning
Recommended reading/ Empfehlungsliteratur

Name of Module/ Modultitel: *Postgraduate Research Design and Communication*					
Course Information/ Kursinformationen	**Frequency of delivery/ Häufigkeit des Angebots**	**Length/ Dauer**	**Language/ Sprache**	**ECTS points/ ECTS-Punkte**	**Study hours/ Studentische Arbeitsbelastung**
PG02 Postgraduate Research Design and Communication	Annually	1 Semester	English		Total study hours: 150 Taught hours: 56 Self-study: 94
Module Leader/ Modulverantwortliche(r)/ Lehrende	**Credits/ Leistungspunkte**	**Assessment/ Prüfungsform**		**Teaching mode and methods/ Lehr- und Lernformen**	**Prüfungsleistung**
		1. Individual presentation about a research proposal (10min) 2. Individual research proposal (2000 words)		Lecture, Seminar, Group work, Own research	1. Course work: 30% 2. Course work 70%

Module Description/ Constructive Alignment

This module has been designed to prepare students with the appropriate knowledge and skills in research methods, critical thinking and expression. Students will learn about the basic tools to conduct research using either qualitative or quantitative methodologies frequently applied in postgraduate study. It will also enhance comprehension and interpretation of the mechanics of argumentation; the ability to effectively evaluate the rationale of argument and evidence to support claims; assess the credibility of sources made in claims; and formulate and deliver both verbally and in writing well-structured and critically reasoned arguments and opinions.

Students will work both in groups and individually to prepare research proposals and present (and defend) their approach during linked assessments. A final essay will examine student's ability to reflect critically on research and academic arguments.

Intended Learning Outcomes – Ability to act/ Transferable skills / Handlungskompetenz

Upon completion of this module students will be able to:

- Identify relevant research methods and how they are underpinned with theory using primary, secondary and tertiary sources
- Be familiar with a range of survey techniques, how to assess data quality, and methods of analysis
- Demonstrate a good comprehension of the fundamental aspects of critical thinking and the mechanics of argumentation

Intended Learning Outcomes - Knowledge and subject specific understanding / Fachkompetenz

Upon completion of this module students will be able to:

- Recall the nature, scope and organisation of different research traditions and associated methodologies

- Define research questions, formulate objectives (organise hypothesis testing where relevant), and set decision criteria

Intended Learning Outcomes – Application and generation of knowledge / Methodenkompetenz

Upon completion of this module students will be able to:

- Produce a research proposal in relation to your degree of study
- Be able to identify which theories apply and use tertiary sources in conducting literature research
- Assess the credibility of sources made in claims

Intdended Learning Outcomes – Communication and cooperation / Sozialkompetenz

Upon completion of this module students will be able to:

- Demonstrate the ability to effectively evaluate the rationale of argument and clearly communicate the evidence to support claims
- Formulate and deliver both verbally and in writing well-structured and critically reasoned arguments and opinions

Outline Content/ Lerninhalt

- The research process: design and methods
- Quantitative and qualitative data collection and analysis (including statistics)
- Primary and secondary data literature search and referencing
- Uses and application of information technology and Artificial Intelligence (AI)
- Research ethics
- Writing up and presentation of research
- Introduction to argument and counter-argument – types of argument, language, rhetoric, reason, credibility and evidence
- Critical expression – planning, structure and argument construction

Recommended reading/ Empfehlungsliteratur

Name of Module/ Modultitel: German language and culture					
Course Information/ Kursinformationen	**Frequency of delivery/ Häufigkeit des Angebots**	**Length/ Dauer**	**Language/ Sprache**	**ECTS points/ ECTS-Punkte**	**Study hours/ Studentische Arbeitsbelastung**
GL01 (GL02) German language and culture	Semesterly	1 Semester	English/ German		Total study hours: 100 Taught hours: 42 Self study: 58
Module Leader/ Modulverantwortliche(r)/ Lehrende	**Credits/ Leistungspunkte**	**Assessment/ Prüfungsform**		**Teaching mode and methods/ Lehr- und Lernformen**	**Prüfungsleistung**
		1. Formative assessments including Reading, Speaking, Listening 2. Oral exam		e.g. Lecture, Seminar, Teaching videos, Role Play, Peer to peer learning	Exam: 100%

Module Description/ Constructive Alignment

The module is intended for students who have little or no previous knowledge of German and offers an introduction to the language. Teaching methods are based on interactive language development tasks, such as group work and role playing. It also includes the study of texts, oral development work and listening comprehension exercises. Students are asked to consolidate class work by learning vocabulary and structures, and by reading, watching or listening to material in German. Using of a range of learning aids and a variety of media, such as a reference grammar and a bilingual dictionary, students will be able to progress faster in accredited German classes during their future studies.

Intended Learning Outcomes – Ability to act/ Transferable skills / Handlungskompetenz

Upon completion of this module students will be able to:

- Enable an elementary level of communicative competence in everyday situations
- Develop an awareness of the general social and cultural background of the language

Intended Learning Outcomes - Knowledge and subject specific understanding / Fachkompetenz

Intended Learning Outcomes – Application and generation of knowledge / Methodenkompetenz

Upon completion of this module students will be able to:

- Understand the basic grammatical structures of the German language
- Read and comprehend simple written and aural texts and extract specific, predictable information related to every-day situations

Intdended Learning Outcomes – Communication and cooperation / Sozialkompetenz
Upon completion of this module students will be able to: • Communicate about a variety of general topics requiring a simple and direct exchange of information on familiar and routine matters • Make progress through developing skills of self-study and application and develop an awareness of the diversity of and sensitivity to German culture
Outline Content/ Lerninhalt
Grammar (indicative): • Alphabet and numbers; word order in sentences, questions & polite Imperatives; conjugation in the present tense • Genders of nouns; def./ indef. articles; adverbs of time • Addressing someone in the du-form; interrogative when?' • Verb haben' + Accusative; possessive pronouns • Objects and their genders; use of possessive pronouns; informal & formal ways of addressing people • Expressing likes & dislikes - gern/lieber; ein/kein; verbs + direct object • The time; the days of the week • Use of modal verbs können',müssen', wollen'; prepositions either followed by the accusative or the dative depending on the context • Adjective endings in front of nouns Es gibt' (There is / are) ... + Accusative; adjectives in attributive/ predicative position • Use of the informal Imperative • Demonstrative adjectives • Prepositions + Dative / Accusative • The months: subordinate clauses introduced by dass'; use of the past tense forms (past tense of haben / sein + past participle of the verb) Topics (indicative): • Overview of German culture and customs • Greeting others and introducing oneself • Talking about today and yesterday • Order Food at Fast Food Restaurant • Dining in Restaurant • Date, Time, and Transportation • Shopping
Recommended reading/ Empfehlungsliteratur