

Programme Specifications

Engineering and IT – FEI1

Version 3.0 January 2025

Progression Degrees

BEng Electrical Engineering ^b
BEng Mechanical Engineering ^b
BEng Business Engineering ^b
BEng Applied Mechatronic Systems ^b
BSc Computer Science ^a
BSc Computer Science - Healthcare Management ^a
BSc Web Development ^a
BA UX User Experience Design and Content Creation ^a

Foundation Overview

Duration	2 Semesters (28 teaching weeks)
Occurrence	October, January
Total teaching hours face to face	511
Total study hours	889
Language	English

Foundation Modules

	Modules	Codes	
1	English language and Academic skills	UG01 & UG02	Semester 1 & 2
2	Critical and Creative Thinking	UG03	Semester 1
3	Maths	UG11	Semester 1
4	German language and culture	GL01 & GL02	Semester 1 & 2
5	Introduction to Programming ^a	UG08	Semester 2
6	Physics for Engineers ^b	UG09	Semester 2
7	Ethics	UG07	Semester 2

^{a/b}Depending on Degree Programme



Name of Module/ Modultitel: English Language and Academic Skills							
Course Information/ Kursinformatio nen	Frequency of delivery/ Häufigkeit des Angebots			ECTS points/ ECTS-Punkte	Study hours/ Studentische Arbeitsbelastung		
UG01 & UG02 English Language and Academic Skills	Annually	2 Semesters English			Total study hours: 600 Taught hours: 224 Self-study: 376		
Module Leader/ Modulverantwo rtliche(r)/ Lehrende	Credits/ Leistungspunkte	Assessment/ Prüfungsform		Teaching mode and methods/ Lehr- und Lernformen	Weighting/ Prüfungsleistung		
		Short summary of reading text (500 words)		Lectures, Seminars, Tutorials, Group work	1. Course work 40% 2. Course work 60% UG02 3. Course work 60% 4. Exam 40%		

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 and 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 Al 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
- Research skills introduction to different methodologies, research design and methods. Data collection and analysis, including uses and application of information technology and Artificial Intelligence (AI).
- 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



Name of Module/ Modultitel: Critical and Creative Thinking							
Course Information/ Kursinformatio nen	Frequency of delivery/ Häufigkeit des Angebots	Length/ Dauer	Language/ Sprache	ECTS points/ ECTS-Punkte	Study hours/ Studentische Arbeitsbelastung		
UG03 Critical and Creative Thinking	Annually	1 Semester	English		Total study hours: 150 Taught hours: 56 Self-study: 94		
Module Leader/ Modulverantwo rtliche(r)/ Lehrende	Credits/ Leistungspunkte	Assessment/ Prüfungsform		Teaching mode and methods/ Lehr- und Lernformen	Prüfungsleistung		
		 Formative assignment Argument essay 1000 words Research project report 1000 words 		Lectures, Seminars, Tutorials, Group work	1. Course work: 50% 2. Course work: 50%		

This Critical and Creative Thinking module teaches students to create effective arguments through objectively assessing different types of information and literature. It is crucial for good degree outcomes and future employability to teach students to recognise logical fallacies, identify credibility and can make logical, rational arguments that avoid bias.

This module is designed to teach, reinforce, and practice independent learning and critical thinking, as opposed to rote memorisation. Teachers will use a range of techniques such as open discussion in class, presentations and individual research (e.g. on Fake news) to encourage critical thinking skills within daily, academic and professional-facing contexts. It will deepen the understanding and interpretation of processes, motives, argument, rationale, credibility of a wide range of studies.

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

Upon completion of this module students will be able to:

- Demonstrate an ability to examine and comment on component parts of a particular argument to develop a structured and analytical response
- Analyse sources of information, regardless of format, and evaluate their relevance and reliability and use these
 appropriately in the development of an argument including reliability, argument mapping, and identifying fallibility

Intended Learning Outcomes - Knowledge and subject specific understanding / Fachkompetenz

Students will develop key skills in critical and creative thinking, including effective debating, negotiation and argumentation. They will learn to use brainstorming and scenario-building techniques, distinguish between fact and opinion and evaluate arguments for clarity and consistency. The course will also cover hypothesis generation, the use of various types of evidence and how to synthesize and present data to support well-reasoned arguments.

Intended Learning Outcomes - Application and generation of knowledge / Methodenkompetenz



Upon completion of this module students will be able to:

- Understand and evaluate the credibility of various types of evidence, inclusive of qualitative and quantitative approaches
- Define and critically assess arguments and evidence from a range of academic sources

Intended Learning Outcomes – Communication and cooperation / Sozialkompetenz

Upon completion of this module students will be able to:

- Describe how knowledge, evidence, and errors in thinking influence problem solving
- Define and explain bias

Outline Content/Lerninhalt

This Module will apply different forms of thinking and creating critical thinking skills, and how to apply them:

- Developing Skills in Debating, Influencing, Negotiating, Gaining agreement
- Brainstorming / Mind-mapping / Scenario-building
- Fact vs Opinion / Objectivity vs Subjectivity
- Hypothesis Generation / Consideration of Alternatives
- Formulating Effective Arguments / Taking a Position / Critical Evaluation of Arguments
- Using Arguments in Writing (Effective Essay Structure)
- Evaluating Arguments I: Good Clarity / logical consistency / structure
- Evaluating Arguments II: Poor Identifying flaws in arguments: false assumptions, ambiguity, irrelevance and bias
- Types of Evidence: Primary / Secondary / Quantitative / Qualitative / Controlling Variables / Collecting / Using samples
- Critical Synthesis from Multiple Sources
- Pattern Recognition and fusing Data / Assessing the Credibility of Evidence
- Using & Presenting Data to Support an Argument



Name of Module/ Modultitel: Maths							
Course Information/ Kursinformatio nen	Frequency of delivery/ Häufigkeit des Angebots	Length/ Dauer	Language/ Sprache	ECTS points/ ECTS-Punkte	Study hours/ Studentische Arbeitsbelastung		
UG11 Maths	Annually	1 Semester	English		Total study hours: 150 Taught hours: 56 Self-study: 94		
Module Leader/ Modulverantw ortliche(r)/ Lehrende	Credits/ Leistungspunkte	Assessment/ Prüfungsform		Teaching mode and methods/ Lehr- und Lernformen	Prüfungsleistung		
		 Exam (closed book) (1.5 hours) Final exam (closed book) (2 hours) 		Lectures, Seminars, Tutorials, Student- managed learning	1. Exam: 40% 2. Exam: 60%		

Having successfully completed the module, students will have both consolidated and gained further necessary mathematical skills required to study at first year undergraduate level. Students will be able to carry out the basic and Foundational mathematical manipulations and understand relevant key concepts through theoretical and practical teaching methods. The topics covered include a range of arithmetic skills, algebra, solving equations, probability and basic statistics, the focus is on building core skills and understanding.

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

Upon completion of this module, students will be able to confidently work with numbers, including the usage of a calculator where necessary. Students will also be able to apply fundamental mathematical principles throughout their other study modules, considering a variety of real-world contexts.

Intended Learning Outcomes - Knowledge and subject specific understanding / Fachkompetenz

Upon completion of this module, students will be able to:

Define basic principles of Arithmetic and Calculus, Trigonometric functions, Linear and Non-Linear Equation,
 Statistics, Basic principles of probability, Polynomial division, Laws of Logarithms, Matrices and Integration and differentiation rules.

Intended Learning Outcomes - Application and generation of knowledge / Methodenkompetenz

Upon completion of this module, students will be able to:



 Apply their mathematical knowledge to solve problems in the areas of Arithmetic and Calculus, Trigonometric functions, Linear and Non-Linear Equation, Statistics, Basic principles of probability, Polynomial division, Laws Logarithms, Matrices and Integration and differentiation rules.
Intended Learning Outcomes – Communication and Cooperation / Sozialkompetenz
Outline Content/ Lerninhalt
This module covers an introduction to the following:
Arithmetic and Calculus
Trigonometric functions
Linear and Non-Linear Equation
• Statistics
Basic principles of probability
Polynomial division
Laws of Logarithms
• Matrices
Integration and differentiation rules
Recommended reading/ Empfehlungsliteratur



Name of Module/ Modultitel: German language and culture							
Course Information/ Kursinformatio nen	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	2 Semesters	English/ German		Total study hours: 200 Taught hours: 63 Self-study: 137		
Module Leader/ Modulverantwo rtliche(r)/ Lehrende	Credits/ Leistungspunkte	Assessment/ Prüfungsform		Teaching mode and methods/ Lehr- und Lernformen	Prüfungsleistung		
		Oral exam at end of Semester 1		e.g. Lecture, Seminar, Teaching videos, Role Play, Peer to peer learning	Exam: 100%		

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 everyday 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



Course Information/ Kursinformati onen	Frequency of delivery/ Häufigkeit des Angebots	Length/ Dauer	Language/ Sprache	ECTS points/ ECTS-Punkte	Study hours/ Studentische Arbeitsbelastung
UG08 Introduction to Programming	Annually	1 Semester	English		Total study hours: 150 Taught hours: 56 Self-study: 94
Module Leader/ Modulverant wortliche(r)/ Lehrende	Credits/ Leistungspunkte	Assessment/ Prüfungsform		Teaching mode and methods/ Lehr- und Lernformen	Prüfungsleistung
ТВС		 Exam includes MCQ and Coding (2 hours) Presentation and demonstration of Portfolio (10 minutes each student) 		Lecture, Seminar, Student Managed Learning	1. Exam: 60% 2. Course work: 40%

This module introduces students to basic concepts of programming, focusing on Python language. Students will learn basic syntax, control structures and functions, enabling them to write organized and efficient code. The course covers key topics such as data structures, file handling, error handling and an introduction to object-oriented programming (OOP). Students will also gain practical experience with version control using Git, apply basic algorithms to solve problems, and develop a portfolio of projects. Emphasis is placed on practical application, problem-solving, teamwork and effective communication in a programming context. By the end of the module, students will have a solid foundation and be prepared to tackle more advanced topics in programming.

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

Upon completion of this module, students will be able to solve problems, write organized code, use Git for version control, handle data and errors, apply object-oriented principles, develop algorithms, present projects, adapt to new tools and collaborate effectively in a team.

Intended Learning Outcomes - Knowledge and subject specific understanding / Fachkompetenz

Upon completion of this module, students will be able to:

- Distinguish between the different paradigms of programming languages and their effect on language design
- Demonstrate knowledge of a range of programming paradigms and example languages such as Python

Intended Learning Outcomes - Application and generation of knowledge / Methodenkompetenz



Upon completion of this module, students will be able to:

- Apply programming concepts to create functional software applications that address real-world problems
- Develop and implement software projects from concept to completion, integrating various programming techniques and tools.
- Construct a portfolio of diverse projects demonstrating the practical application of programming skills and knowledge.
- Generate creative solutions by applying programming knowledge to novel situations and challenges.

Intended Learning Outcomes - Communication and cooperation / Sozialkompetenz

Student will effectively communicate technical concepts, collaborate on coding projects using tools like Git, and work efficiently within a team environment.

Outline Content/Lerninhalt

- Introduction to Programming
- Basic Syntax and Variables
- Control Structures
- Functions
- Introduction to Git
- Data Structures
- File Handling
- Error Handling
- Introduction to Object-Oriented Programming (OOP)
- Basic Algorithms and Problem-Solving
- Final Presentation and demonstration of portfolio



Name of Module	Name of Module/ Modultitel: Physics for Engineers						
Course Information/ Kursinformatio nen	Frequency of delivery/ Häufigkeit des Angebots	Length/ Dauer	Language / Sprache	ECTS points/ ECTS- Punkte	Study hours/ Studentische Arbeitsbelastung		
UG09 Physics for Engineers	Annually	1 Semester	English		Total study hours: 150 Taught hours: 56 Self-study: 94		
Module Leader/ Modulverantw ortliche(r)/ Lehrende	Credits/ Leistungspunkte	Assessment/ Prüfungsform		Teaching mode and methods/ Lehr- und Lernformen	Prüfungsleistung		
TBC		1.Laboratory Report (1200 words) 2. Final exam: (2 hours)		Lectures, Demonstrations, In-class exercises, Laboratory experiments, Student-managed learning.	1. Course work: 40% 2. Exam: 60%		

This module provides students with a solid foundation in the physical sciences to prepare them for their first-year undergraduate studies. Students will primarily solve numerical problems related to engineering. By the end of this module, students will possess the ability to analyse the motion of objects in one and two dimensions with constant acceleration. They will have a good understanding of friction and its impact on moving and static systems. Moreover, they will be acquainted with simple statically determinant systems and capable of calculating forces in equilibrium. Additionally, students will be familiar with the principles of conservation of mechanical energy and conservation of momentum, and they will be able to apply them to simple scenarios.

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

Upon completion of this module, students will be able to think critically and apply their knowledge and understanding of physics to establish the link between theory and physical observation and recognise the quantitative nature of physics and understand how mathematical expressions relate to physical principles. Students will also be able to apply the knowledge of measurement in different context and dimensional analysis and bring together knowledge to illustrate ways in which different areas of physics and engineering relate to each other.

Intended Learning Outcomes - Knowledge and subject specific understanding / Fachkompetenz

Upon completion of this module students will be able to:

- Recall and define the physical laws that govern forces and motion and their relevance to engineering principles
- Recall and describe the fundamentals of mechanics and thermos-fluid mechanics
- Understand the relevance of kinetic theory to practical engineering applications including the internal combustion engine
- Understand the conservation of energy/work laws and their importance in the physical world of engineering.



- Recall the concept of entropy within physical systems
- Understand and determine the physical interaction of light with transmission and reflective mediums

Intended Learning Outcomes - Application and generation of knowledge / Methodenkompetenz

Upon completion of this module, students will be able to:

- Analyse and apply qualitative and quantitative principles to physical phenomena
- Proficiently use techniques and technology in the collation, interpretation and presentation of data in written formats
- Apply the theory of thermodynamics to practical applications in engineering

Intended Learning Outcomes - Communication and cooperation / Sozialkompetenz

Upon completion of this module, students will be able to:

- Provide explanation of key physics concepts and theories.
- Able to use appropriate scientific terminology and symbols when describing physical phenomena in reports, presentations, and discussions
- To collaborate and value different approaches in problem-solving.
- To develop both communication and teamwork skills

Outline Content/Lerninhalt

- Introduction to physics & measurements, scalar and vector quantities
- Forces in equilibrium and momentum
- Motion, force and Newton's laws of motion
- Work-energy and power
- Electricity and electric current
- Ohm's law, DC circuits and Kirchhoff's laws
- Materials
- Fluid dynamics
- Physical optics
- Friction
- Statics
- Conservation of mechanical energy
- Kinematics in 1D and 2D



Name of Module/ Modultitel: Ethics								
Course Information/ Kursinformatio nen	Frequency of delivery/ Häufigkeit des Angebots	Length/ Dauer	Language/ Sprache	ECTS points/ ECTS-Punkte	Study hours/ Studentische Arbeitsbelastung			
UG07 Ethics	Annually	1 Semester	English		Total study hours: 150 Taught hours: 56 Self-study: 94			
Module Leader/ Modulverantw ortliche(r)/ Lehrende	Credits/ Leistungspunkte	Assessment/ Prüfungsform		Teaching mode and methods/ Lehr- und Lernformen	Prüfungsleistung			
		Individual Presentation (5 min) Case Study Report 1000 words		Lecture, Seminar, Group work, Flipped classroom	 Course work 50% Course work 50% 			

Ethics is a system of moral principles that affects decision-making, based on what one considers to be 'right' and 'wrong'. Students will be encouraged to use critical thinking and research to discuss descriptive, normative and analytic approaches to ethics and ethical problems. Students will look at a variety of applications to understand the interdependence and intersection between behaving ethically in varying contexts.

With respect to ethical questions, students will investigate competing answers to an idea and critically engage with these to examine their strengths and weaknesses. Through case study analysis and own research, students will gain a broad understanding of how ethics can be applied to a variety of subject areas and what questions should be asked to evaluate validity.

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

Upon completion of this module students will be able to:

- Employ the tools of critical analysis in their thinking and writing by applying the appropriate resources to support an ethical viewpoint
- Know how ethics can be applied to a variety of subject areas and what questions should be asked to evaluate validity

Intended Learning Outcomes - Knowledge and subject specific understanding / Fachkompetenz

Upon completion of this module students will be able to:

- Recall ethical issues and developments in the main areas of study across the Business, Engineering and Creative fields
- Define areas of debate within ethics including the ideas of different thinkers (e.g. Kant, Plato)



Intended Learning Outcomes – Application and generation of knowledge / Methodenkompetenz

Upon completion of this module students will be able to:

- Explain the relevance of ethical approval for practices
- Discuss differing viewpoints and their ethical implications and apply these to case studies

Intdended Learning Outcomes – Communication and cooperation / Sozialkompetenz

Upon completion of this module students will be able to:

• Interrogate claims to understand the nature of acceptable principles in behaviour and treatment from individuals and by different cultures

Outline Content/ Lerninhalt

- Introduction and Course Structure
- Media Integrity Ethics
- Business and Business Integrity Ethics
- Appropriation and Attribution
- Systematic Moral Analysis
- Challenges to Ethical Living
- Important Ethical Terms
- Ethical Systems (e.g., Deontology, Utilitarianism)
- Ethics in Society
- Animal Ethics
- Environmental Ethics
- Psychology in Ethics
- Political Ethics
- Mock United Nations