ANNEX 4.

PROGRAM-SPECIFIC STUDY AND EXAM REGULATIONS FOR THE BACHELOR OF SCIENCE IN INDUSTRIAL ENGINEERING Incl. STUDY PLAN AND MODULE HANDBOOK

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AIMS AND OBJECTIVES

The aim of the “Industrial Engineering” Program is to enable the graduates to cope with multifaceted technical and economic demands of the industry world. The Program concept is guided by the Berlin-Model and consists of three pillars, two of which focus on professional expertise while the third one ensures practical skills competence: engineering science, business sciences, and integrative skills.

Thus, the overall objectives of the Program can be seen as to convey an ability to understand new scientific findings at the intersection of technical and business sciences, to identify connections, and to apply in creating practical solutions:

1. Understand and shape technical processes
2. Possess sound knowledge in subject-specific scientific methods and instruments
3. Efficiently prepare economic/business decisions using appropriate instruments
4. Independently identify and solve technical and economic problems.

The Program is to qualify the graduates for an application-oriented employment or for entrepreneurship in the field of Industrial Engineering, and for life-long learning. Industrial engineers combine technical expertise with economic judgement and managerial skills in order to eliminate waste in new or existing manufacturing processes and systems. With growing consciousness about careful use of limited resources both globally and in Mongolia, the Program helps to learn in interdisciplinary grounds, preparing graduates for a multitude of responsibilities in their future jobs.

As all-rounders, the graduates have the knowledge and, if necessary, the ability to become acquainted with the relevant specializations in their future professional or academic life. They understand the technical aspects as well as the economics of technology; they are able to work together with engineers, scientists from various disciplines, and practitioners and policy-makers, moreover, they ensure that such collaborations are successful.

In addition, graduates are able to handle tasks in differing conditions. They possess leadership, interpersonal and language skills to communicate their technical subject matter in an international professional environment. The new forms of teaching and experiential learning, together with the modules for instilling key competences parallel to the technical studies, all combine to provide a targeted preparation for a professional life.

The graduates of the “Industrial Engineering” Program will be able to:

- Apply the principles of mathematical, engineering and economic sciences for optimization of processes and systems in manufacturing;
- Recognize, analyze complex problems and develop integrated engineering and economic solutions;
- Use their interdisciplinary knowledge to apply in the design, development, production, distribution of business services along the entire value chain;
- Apply information science and analyze big data for solving industrial engineering problems;
- Work in teams with people of diverse expertise and different cultural backgrounds; connect them meaningfully in order to solve extensive and interdisciplinary problems;
- Recognize the consequences of engineering activities in order to act responsibly within and for society, the economy, and the environment;
- Customize their profession to their interest.

CURRICULUM STRUCTURE

To achieve the aims and objectives of this Program, the curriculum is structured in two parts. The first part consists first two years and provides the foundation knowledge for all engineering programs. It focuses on scientific modules such as Mathematics, Chemistry, Physics, and Basic Mechanics, but also introduces students to program-relevant basics through such modules like Introduction to Economics, Introduction to Business Administration and Engineering Management, as well as Law and Engineer in Society. Also, the soft skills such as communication skills, technical English and German, and scientific writing skills are taught.

The second part starts with the third year and goes to end of the 4th year. The curriculum provides (i) professional modules in different aspects of business administration, (ii) elective modules on engineering with opportunities to deepen students' technical expertise, and finally (iii) integrative modules with opportunities to learn how to leverage their technical expertise, economic acumen, and managerial prowess to optimize manufacturing processes and systems, reducing inefficiencies and ensuring sustainability. This curriculum equips students with interdisciplinary knowledge, preparing them for diverse roles in their future careers, and graduates grain a broad skill set such as analytical, strategic thinking, problem-solving, and decision-making. The professional internship module provides students with opportunities to deepen and practice skills gained in the first three years in real-life situation. The bachelor thesis provides research experience to create solutions and write a logical document. Especially, the final study project

offers students an opportunity to cooperate with students from other study program, connect their fields of expertise and to solve a real problem.

The students who want to major Industrial Engineering program should complete the first two years' curriculum successfully with the minimum of 100 credit points. To write a bachelor thesis, a student should earn at least 171 credit point before he or she starts the 7th semester. The total amount of CPs for graduation has to be minimum 240 CPs.

MODULE DESCRIPTIONS

The description of each module is provided in this document following Study Plan.

ELECTIVES

Once students major in Industrial Engineering, they should take a minimum of 3 engineering elective modules and 1 business elective module. Starting 3rd year, students can choose professional engineering modules from the other programs as electives. Hereby, presupposed for participation and recognition of the elective module is that the required prerequisites of the chosen elective module already have been passed. Furthermore, the adjustment of the lecture times for attendance in the chosen elective modules can only be made by ASA in exceptional cases. The students must choose his subjects in such a way that participation in his program-related modules is not endangered or restricted. A selection of such professional engineering modules is listed in the module descriptions following Study Plan. Additionally, students can take English and German language modules as electives.

STUDY PLAN

CPs	1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	7th Semester	8th Semester
1	MATH101 Mathematics I 6 CP (3 UoIL, 3 UoIR)	MATH102 Mathematics II 8 CP (4 UoIL, 4 UoIR)	EMNE201 Engineering Mechanics II (Dynamics) 4 CP (2 UoIL, 2 UoIR)	MEAS201 Measurement, Instrumentation, and Control Basics 4 CP (2 UoIL, 1 UoIR, 1 UoILab)	INDE301 Project Management 6 CP (1 UoIL, 2 UoIR, 1 UoIFt)	INDE305 Fundamentals of Marketing Management 4 CP (2 UoIL, 2 UoIR)	INDE401 Finance for Engineers II 6 CP (2 UoIL, 2 UoIR)	INDE404 Natural Resource Governance 4 CP (2 UoIL, 2 UoIR)
2								
3								
4								
5			STAT201 Introduction to Statistic 4 CP (2 UoIL, 2 UoIR)	CAD201 Computer-Aided Design (CAD) 4 CP (1 UoIL, 3 UoILab)		INDE306 Supply Chain Management 6 CP (2 UoIL, 2 UoIR)		
6								
7	CHEM101 Chemistry 5 CP (3 UoIL, 2 UoIR)				INDE302 Introduction to Accounting 4 CP (2 UoIL, 2 UoIR)		INDE402 Operations Research 6 CP (2 UoIL, 2 UoIR)	INDE405 Quality Management 6 CP (2 UoIL, 2 UoIR)
8								
9		MATS101 Materials Science 4 CP (2 UoIL, 2 UoIR)	THER201 Engineering Thermodynamics 4 CP (2 UoIL, 2 UoIR)	FLME201 Fluid Mechanics 4 CP (2 UoIL, 2 UoIR)		INDE307 Business Information Systems 4 CP (2 UoIL, 2 UoIR)		
10								
11								
12	GEOS101 Introduction to Geoscience 4 CP (2 UoIL, 2 UoIR)				INDE303 Operations Management 6 CP (2 UoIL, 2 UoIR)			
13		EMNE101 Engineering Mechanics I (Statics) 4 CP (2 UoIL, 2 UoIR)	DESN201 Engineering Design 4 CP (1 UoIL, 3 UoIR)	RREC201 Raw Materials & Recycling 4 CP (2 UoIL, 2 UoIFt)		INDE308 Finance for Engineers I 4 CP (2 UoIL, 2 UoIR)	INDE403 Introduction to Organizational Behavior 4 CP (2 UoIL, 2 UoIR)	PROJ401 Final Study Project 6CP
14								
15								
16	PROG101 Algorithms and Programming 4 CP (1 UoIL, 3 UoILab)							
17		PHYS101 Physics 6 CP (1 UoIL, 1 UoIR, 4 UoILab)	ELECJ201 Introduction to Electrical Engineering 4 CP (2 UoIL, 2 UoIR)	SCIM201 Scientific Methods 2 CP (2 UoIR)	INDE304 Entrepreneurship 4 CP (1 UoIL, 2 UoIR 1 UoIFt)	INTR301 Industrial Internship + Reflection 10 CP 14 weeks	STWR401 Scientific Writing 4 CP (2 UoIR)	
18								
19				HSE201 Health-Safety-Environment 4 CP (2 UoIL, 1 UoIR, 1 UoIIFt)				
20	ENSO101 Engineer in Society 2 CP (1 UoIL, 1 UoIR)							
21			MINE201 Introduction to Mining 4 CP (4 UoIL)		Engineering Elective 4 CP		Engineering Elective 4 CP	
22	PROJ101 Engineering Project 2 CP (2 UoIR)							
23		CHEM102 Chemistry Lab 3 CP (3 UoILab)		LAW201 Law 2 CP (2 UoIL)				
24	ENGL101 Technical English 4 CP (4 UoIR)							THES401 Bachelor Thesis + Colloquium 12 CP
25			ECON201 Introduction to Economics 4 CP (2 UoIL, 2 UoIR)	INTR201 Basic Internship 2 CP, 6 weeks	Elective 4 CP		Business Elective 4 CP	
26								
27		BAEM101 Introduction to BA and Engineering Management 4 CP (2 UoIL, 2 UoIR,)						
28	INCC101 Intercultural Comm & Competence 2 CP (2 UoIR)							
29					Elective 4 CP	Engineering Elective 4 CP		
30	TIME101	Electives no less than 6 CP						

31	Time Management 2 CP (2 UoIR)							
32								
Total CP	**31**	**31**	**30**	**28**	**32**	**32**	**28**	**28**

Legend:								
	CP =	Credit Points	Fundamentals	Specialization	General	Foreign Languages	Internship / Thesis	Electives
	UoI =	Unit of Instruction (45 min. per unit)		UoILab =	Unit of Instruction Laboratory			
	UoIL =	Unit of Instruction Lecture		UoIFt =	Unit of Instruction Field trip			
	UoIR =	Unit of Instruction Recitation						

****Electives: Every 3rd and 4th year student can choose professional engineering modules from the other programs as electives. Presupposed for participation and recognition of the elective module is that the required prerequisites of the chosen elective module already have been passed. Furthermore, the adjustment of the lecture times for attendance in the chosen elective modules can only be made by ASA in exceptional cases. The student must choose his subjects in such a way that participation in his program-related modules is not endangered or restricted.**

****** There should be a minimum of 3 Engineering Electives and 1 Business Elective.**

GENERAL ENGINEERING MODULES (1ST – 4TH SEMESTERS)

MATH101 – MATHEMATICS I

Module title	Mathematics I			**Module code**	MATH101
Duration	1 semester	**Semester**	Fall	**Module start**	1st
Credit points	6 CP	**Workload**	180 h	**Contact hours**	72 h
				Individual study	108 h
Module coordinator	Prof. L. Altangerel			**Language**	English
Contents	• Basics: logic, sets, functions and number sets (real and complex numbers) • Basic linear algebra: matrices, determinants, systems of linear equations, eigenvalue problems, vector spaces, linear maps • Analysis of functions of a single variable: series and functions, limits and continuity, differentiation and integration				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Describe and explain basic mathematical topics and methods. 2. Demonstrate and apply the basic principles of linear algebra. 3. Demonstrate and apply the basic concepts of analysis of a single variable. 4. Examine mathematical models to represent and solve simple scientific and engineering problems**.**				
Literature	1. Stewart J, Clegg D, Watson S. Calculus Early Transcendentals. 9th ed. Boston: Cengage Learning; 2019. 2. Thomas GB, Hass JR, Heil C, Weir MD. Thomas' CALCULUS Early Transcendentals. 14th ed. Boston: Pearson; 2018.. 3. Anton H, Rorres C. Elementary Linear Algebra: Applications Version. 11th ed.: Viley; 2013 4. Rosen KH. Discrete Mathematics and Its Applications. 7th ed. New York: McGraw-Hill; 2012.				
Form of teaching	Lecture (3 UoI) Recitation (3 UoI)				
Assessment method	Written examination (90 min.) and academic performance				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	None				

Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 70% and the module examination accounting for 30%.

CHEM101 – CHEMISTRY

Module title	Chemistry			**Module code**	CHEM101
Duration	1 semester	**Semester**	Fall	**Module start**	1st
Credit points	5 CP	**Workload**	150 h	**Contact hours**	60 h
				Individual study	90 h
Module coordinator	J. Bayardulam			**Language**	English
Contents	The students will be introduced chemistry and familiarized with the basic principles and concepts of organic, inorganic and physical chemistry • Introduction of chemistry • The components of Matter; Atomic theory, • Compounds, Formulas, Names & Mass of compounds • The mole, Determining the formula of unknown compound, Writing and balancing chemical equation • Calculating quantities of reactant & products, Fundamentals of solution stoichiometry. • The nature of light, atomic spectra, The Quantum-Mechanical model of the atom • Electron configuration and Chemical periodicity • Atomic properties and chemical bonds, The ionic bonding model, The covalent bonding model, Bond energy and chemical changes • Gas pressure and its measurement, the Gas laws, rearrangement of the ideal gas law • The types of Intermolecular forces, properties of liquid and solids • Enthalpy, Calorimetry, Stoichiometry of thermochemical equation, Hess's law, Standard enthalpies of reaction • Theories of covalent bonding • Kinetics: The reaction rate, Rate laws, Integrated rate law, Theories of chemical kinetics • Equilibrium: The reaction quotient and equilibrium constant, Expressing equilibria Kc and Kp • Equilibrium: Q & K to determine the reaction direction, Solve the equilibrium problem, Le Chatelier's principle • Acid-Base equilibria: Acids and bases in water, Autoionization of water, pH scale, Bronsted-Lowry theory, Problem solving weak-acid equilibria • Ionic equilibria: Equilibria of acid-base buffers, Acid-base titration curves, Equilibria of slightly soluble ionic compounds • Thermodynamics: Entropy, Free energy and Direction of chemical reaction • Electrochemistry: Redox reaction • Electrochemistry: Voltaic cells, Electrolytic cells, Cell potential, Nernst equation, electrochemical process in batteries, corrosion • Transition elements and their Coordination compounds, Crystal filed theory • Introduction to organic chemistry: Alkanes, Cycloalkane, Alkenes, Alkynes • The monomer-polymer: Addition polymer, Condensation polymer, Sugar and polysaccharides, • Nuclear chemistry				

Learning outcomes	On successful completion of this module, the students should be able to: 1. Explain the atomic structure of chemical elements and chemical bonds of molecules, apply chemical nomenclature to chemical compounds and stoichiometric calculations of the chemical reaction. 2. Use the chemical equilibrium concept in the practical application 3. Interpret the kinetics of chemical reactions and solve kinetics problems. 4. Apply the basic concepts of analytical chemistry in chemical analysis 5. Balance redox reactions, explain the electrochemical reaction, and design and apply electrochemical cells. 6. Apply the acquired basic definitions of thermodynamics in thermodynamic systems. 7. Explain the structure, properties and synthesis of hydrocarbons & and polymers 8. Interpret the basic concepts of nuclear chemistry and solve the nuclear chemical reaction problems. 9. Apply the acquired knowledge, and practice teamwork and presentation skills.
Literature	1. Atkins P, Jones L, Laverman L. Chemical Principles: The quest for insight. 6th ed. Rossignol RB, editor. New York: W. H. Freeman and Company; 2013. 3. Silberberg MS. CHEMISTRY: The Molecular Nature of Matter and Change. 6th ed. Marty Lange JH, editor. New York: McGraw-Hill; 2012. 2. Brown LS, Holme TA. Chemistry for Engineering Students. 2nd ed. Charles Hartford RHAS, editor. Belmont, CA: Brooks/Cole, Cengage Learning; 2011.
Form of teaching	Lecture (3 UoI) Recitation (2 UoI)
Assessment methods	Written examination (120 min.) and academic performance for lecture and recitation
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy & Electrical Engineering B.Sc. Mechatronic Engineering
Prerequisites for participation	None
Requirements for receiving credit points	Passing the module
Grading system	The grade of chemistry consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%

GEOS101 – INTRODUCTION TO GEOSCIENCE

Module title	Introduction to Geoscience			**Module code**	GEOS101
Duration	1 semester	**Semester**	Fall	**Module start**	1st
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. G. Gantuya			**Language**	English
Contents	• Earth Processes Earth's structure; endogenous processes (plutonism, volcanism, metamorphism; plate tectonics); exogenous processes (erosion, sedimentation); determination of rocks using simple aids (hand specimen of magmatic, metamorphic and sedimentary rocks). • Earth Materials Crystal forms, chemical and physical properties of minerals, classification of minerals; systematic mineralogy of selected native elements, hydroxides and halides, silicates, carbonates, oxides and sulphides; applied mineralogy of ore and industrial minerals and gems; environmental properties of minerals; determination of minerals using simple aids. • Earth Resources Origin of, prospecting for, and extraction of mineral raw materials, global distribution of ore deposits, endogenous and exogenous ore forming processes, classification of ore deposit types, plate-tectonic control on ore deposits formation, properties and uses of common ore and industrial minerals, and volume commodities, economic significance of mineral raw materials to the national economy, introduction to economic, technical and ecological aspects of raw materials extraction with respect to the sustainable use of geological resources; determination of ore samples using simple aids (small hand specimen of metallic and non-metallic ores). • Earth's atmosphere Fundamentals of the global atmospheric circulation system, weather and climate parameters; distribution of solar insolation and orbital parameters; its influence on the distribution of climate and ecological zones. Brief climate history of the Earth, climate change, future climate change scenarios.				
Learning outcomes	I. Earth Processes On successful completion of this module, the students should be able to: 1. Recall the shell structure of the Earth and plate-tectonic processes. 2. Differentiate between the structures of the Earth's oceanic and continental crust. 3. Recall the processes of plutonic, volcanic and metamorphic rock formation. 4. Recognize important rock types and describe their mineral composition and structure. II. Earth Materials On successful completion of this module, the students should be able to: 1. Identify the crystallographic and physical-chemical properties of minerals. 2. Classify minerals into crystallographic and chemical classes.				

	3. Identify the salient properties (chemical formula, crystal form, Moh's hardness, density, color, cleavage and fracture) of native elements, hydroxide and halide, silicate, carbonate, oxide and sulphide minerals. 4. Identify the industrial uses and environmental properties of the metallic and non-metallic ores and gemstones. 5. Identify important minerals and know their respective chemical formulae. III. Earth Resources On successful completion of this module, the students should be able to: 1. Classify ore deposits into groups of metallic and non-metallic raw materials and recall the different types of ore deposits. 2. Recall the processes of endogenous and exogenous ore deposit formation in the context of plate tectonics. 3. Recall the global distribution of ore deposits of the various raw materials. 4. Recall the properties and uses of the main ores and industrial minerals and volume commodities. 5. Recall the economic, technical and ecological aspects of the extraction of raw materials. 6. Summarize terms measures for the sustainable use of Earth resources in qualitative terms. 7. Recognize relevant ore samples and describe their mineral composition and structure. IV. Earth's atmosphere On successful completion of this module, the students should be able to: 1. Identify weather and climate elements 2. Recognize monitoring tools of weather elements 3. Recall the fundamentals of the global atmospheric circulation system 4. Clarify past, current, and future climate scenarios.
Literature	1. Klein C, Philpotts AR. Earth Materials: Introduction to Mineralogy and Petrology New York: Cambridge University Press; 2012. 2. Mukherjee S. Applied Mineralogy: Applications in Industry and Environment New York: Capital Publishing Company; 2011. 3. Kresan PL, Mencke R. Student study guide for UNDERSTANDING EARTH. 6th ed. New York: W. H. Freeman and Company; 2010. 4. Wnek HR, Bulakh A. Minerals: Their Constitutions and Origin United Kingdom: Cambridge University Press; 2004. 5. Hamblin WK, Christiansen EH. Earth's Dynamic Systems. 10th ed.; 2004. 6. Evans AM. Ore Geology and Industrial Minerals: An Introduction. 3rd ed. Hallam A, editor.: Blackwell Publishing; 1993.
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)
Assessment method	Written examination (90 min.) and academic performance
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering

	B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering
Prerequisites for participation	None
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 60% and the module examination accounting for 40%.

PROG101 – ALGORITHMS AND PROGRAMMING

Module title	Algorithms and Programming			**Module code**	PROG101
Duration	1 semester	**Semester**	Fall	**Module start**	1st
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Kh. Uyanga			**Language**	English
Contents	• Introduction of Programming Languages (, history of C programming language, syntax, programming process, structure, executing and debugging); • Programming Methodologies (concepts of algorithm design, flowcharts and pseudo codes, number systems) • Structured language (keywords, identifiers, declarations, operators, constants, variables, data types (integer, floating-point data), library functions) • Control Statement and Expressions (statements (if, if … else, switch, goto), arithmetic expressions) • Looping (for, while, do while, jumping, break and continue) • Arrays (one, two, multidimensional) and string (variables and functions) • Functions and Program Structure (C: user-defined and system defined; • File Processing, discipline of programming.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Implement a variety of algorithms for searching and sorting, including linear search, binary search, insertion sort, selection sort, merge sort, quicksort, and heap sort. 2. Describe abstract data types used in C/C++ and explain their usage 3. describe commonly used syntactic constructions used in C/C++ 4. Develop programs and application 5. Apply knowledge in major courses and practical 6. Solve problems 7. Work independently				
Literature	1. Hanly JR, Koffman EB. Problem Solving and Program Design in C. 8th ed. Essex: Pearson Education Limited; 2016. 2. Deitel P, Deitel H. C How to Program. 6th ed. Horton MJ, editor. New Jersey: Pearson Education, Inc.; 2010. 3. Kernighan BW, Ritchie DM. C Programming Language. 2nd ed. New Jersey: Prentice-Hall, Inc; 1988.				
Form of teaching	Lecture (1 UoI) Laboratory (3 UoI)				
Assessment method	Written examination (90 min.) and academic performance				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	None				

Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 50% and the module examination accounting for 50%.

ENSO101 – ENGINEER IN SOCIETY (ETHICS)

Module title	Engineer in Society (Ethics)			**Module code**	ENSO101
Duration	1 semester	**Semester**	Fall	**Module start**	1st
Credit points	2 CP	**Workload**	60 h	**Contact hours**	24 h
				Individual study	36 h
Module coordinator	Prof. B. Battsengel			**Language**	English
Contents	Team teaching: The role of the engineers in the society; focus on science and responsibility.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Differentiate between basic tenets of engineering science, natural science, and the humanities and to recognize the relevance for their profession. 2. Think critically about the role of the engineers in the society. 3. Recognize the ethical responsibility of the engineers in concrete situations and analyze and reflect these problems by using approaches from engineering ethics and argue in. 4. Reflect ethical problems caused by new technological developments, future questions involving technological policies and questions of political shaping and guiding of technological developments while considering their context within society and politics. 5. Think critically about specialist literature on basic tenets of science and the ethics of engineering 6. Express oneself in a differentiated way but yet be clearly understood both in oral and written form questions involving the basic tenets of science and ethics in an interdisciplinary context.				
Literature	1. Martin MW. Introduction to Engineering Ethics. 2nd ed. Debra B. Hash DMS, editor. New York: McGraw-Hill; 2010. 2. Lawlor R. Engineering in Society Lawlor R, editor.; 2004. 3. Rees M. Our final hour: A scientist's warning: How terror, error, and environmental disaster threaten humankind's future in this century - on Earth and beyond New York: Basic Books; 2003.				
Form of teaching	Lecture (1 UoI) Recitation (1 UoI)				
Assessment method	Essay and academic performance				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				

Prerequisites for participation	None
Requirements for receiving credit points	Passing the module
Grading system	Pass/ Fail

PROJ101 – ENGINEERING PROJECT

Module title	Engineering Project			**Module code**	PROJ101
Duration	1 week + report	**Semester**	Fall	**Module start**	1st
Credit points	2 CP	**Workload**	60 h	**Contact hours**	24 h
				Individual study	36 h
Module coordinator	Prof. N. Battulga			**Language**	English
Contents	During the project, students work in small groups on an interdisciplinary assignment. Each student contributes to producing an interdisciplinary solution by working as a team with the resources from their individual disciplinary perspectives. The students of mechanical engineering experience the way an engineer deals with problems, they construct in methodology way and solve complex engineering tasks. The assignment is given out at the beginning of the project. Trained support staff accompanies the groups during the course of the project and encourages the development of social and subject-related skills.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Produce a goal-oriented solution through interdisciplinary teamwork. 2. Comprehend and work on an interdisciplinary assignment using design principles of mechanical engineering. 3. Moderate team processes. 4. Plan, organize and carry out tasks independently. 5. Discuss possible solutions and to reach a decision that is guided by criteria 6. Acquire competence in applying scientific methods and to analyze different problems of a task 7. Present different results to an auditorium and to discuss them respectively 8. Reflect scientific acting and assess its societal consequences.				
Literature	Script				
Form of teaching	Project course (2 UoI)				
Assessment method	Successful participation, group presentation, poster, report				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	None				
Requirements for receiving credit points	Passing the module				
Grading system	Pass/ Fail				

ENGL101 – TECHNICAL ENGLISH

Module title	Technical English			**Module code**	ENGL101
Duration	1 semester	**Semester**	Fall	**Module start**	1st
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Robin Charpentier			**Language**	English
Contents	• General vs Technical English; Latin and Greek Roots • Geotechnology • Properties of Metals • Material Formats • Plastics, Elasticity • Ceramics, Glass, Wood • Precision, Accuracy in Measurements, Safety • MID-TERM EXAM • Process Engineering • Fluid Dynamics, Architectural Drawings/Design • Electricity and Magnetism • Math, Statistics, Graphs, Data Ethics • Invention/Innovation/ Spinoffs • Sustainability; the Circular Economy • Presentation Topic Approval; About Infographics, Poster Sessions • Final Presentations – Poster Session (Infographics)				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Demonstrate understanding of, and properly express/describe STEM – related: abbreviations, root meanings, and definitions of symbols, words, and phrases; graphs and the behavior of lines; equations; and simple technical processes, using appropriate terminology and structures 2. Read short texts on a broad range of STEM – related topics at an intermediate to high-intermediate level, in order to understand some technical details and identify the core meanings, and summarize the information in their own words 3. Follow and grasp the main points in a lecture, including audio-visual material at an intermediate to high-intermediate level, on a broad range of topics in STEM – related fields 4. Effectively communicate both orally and in writing on a broad range of STEM – related topics, in English, using relevant stylistic structures				
Literature	1. Barbara A. Cornelen Campus: Englsih for Mechanical Engineering. B2 Coursebook: Cornelsen; 2011. 2. Supplementary materials related to topics covered				
Form of teaching	Recitation (4 UoI)				

Assessment method	(70%) = Written final examination (30%) = Active in-class participation (15%); tests, mid-term exam, final oral presentation [poster session] (15%)
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering
Prerequisites for participation	• English at the C1 level in all 4 skills • Have an expressed interest in engineering as their major
Requirements for receiving credit points	• Attendance is recorded for those arriving before the scheduled start time • Students must attend at least 80% of the classes in this to be eligible to sit for the Final Exam • Participation means: volunteering answers; asking and/or responding to questions; paying attention; actively focusing on in-class tasks; turning in assignments on time and with good quality
Grading system	The modes of assessment total 100%

INCC101 – INTRODUCTION TO INTERCULTURAL COMMUNICATION AND COMPETENCE

Module title	Introduction to Intercultural Communication and Competence			**Module code**	INCC101
Duration	1 semester	**Semester**	Fall	**Module start**	1st
Credit points	2 CP	**Workload**	60 h	**Contact hours**	24 h
				Individual study	36 h
Module coordinator	Robin Charpentier			**Language**	English
Contents	• Elements and Definitions of Culture • Identity: Scale, Boundaries, Aspirational, Ascriptive • Theories and Models of Culture • Shared vs Unique Aspects of Identity • Cultural Awareness • Communication Types – Identification and Practice • Direct/Indirect Communication in Different Cultures • What do we Need to Know About Them? • Mid-Term Exam • Stereotypes, Prejudice • Conscious/Unconscious Bias • Exploring Communications Approaches - Models • Meyers-Briggs Type Indicators • Cultural Awareness Levels; • Stages of Cultural Adjustment • Case Studies: Analyzing Critical Incidents				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Understand their own cultural background and values, and their importance in dealing successfully with people from other cultures 2. Recognize sensitive cultural particularities, and try to respond to these differences in an appropriate and tactful manner 3. Analyze, post hoc, intercultural incidents that have occurred and develop problem solving strategies for future such cases				
Literature	1. Glaser E, Guilherme M, Garcia MCM, Mughan T. Intercultural Competence for Professional Mobility: Council of Europe Publishing; 2007. 2. Bennett MJ. Basic Concepts of Intercultural Communication: Paradigms, principles, and practices. 2nd ed. Boston: Intecultural Press; 1998.				
Form of teaching	Recitation (2 UoI)				
Assessment method	(70%) = Written final examination (30%) = Active in-class participation (15%); turning in assignments on time and with good quality, mid-term exam (15%)				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering				

	B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering
Prerequisites for participation	English at the C1 level in all 4 skills
Requirements for receiving credit points	• Attendance is recorded for those arriving before the scheduled start time • Students must attend at least 80% of the classes in this to be eligible to sit for the Final Exam • Participation means: volunteering answers; asking and/or responding to questions; paying attention; actively focusing on in-class tasks; turning in assignments on time and with good quality
Grading system	The modes of assessment total 100%

TIME101 – TIME MANAGEMENT

Module title	Time Management			**Module code**	TIME101
Duration	1 semester	**Semester**	Fall	**Module start**	1st
Credit points	2 CP	**Workload**	60 h	**Contact hours**	24 h
				Individual study	36 h
Module coordinator	Prof. Sungchil Lee			**Language**	English
Contents	The students will learn time management skills and self-development skills. • Time management for successful school life • Shaping thinking frame • Values & purpose of life • Prioritizing tasks • Systematic management of tasks • Objective management • Reading & study skills for enhancing intelligent capacity				
Learning outcomes	On successful completion of this module, students should be able to: 1. Recognize the need of time management in their life. 2. Identify greatest time wasters and avoid them 3. Apply time management skills for effective school life. 4. Prioritize and organize tasks systematically. 5. Develop and align their long- and short-term objectives along with life-goals. 6. Motivates themselves for study at GMIT. 7. Apply reading and thinking skills for their study.				
Literature	1. Forsyth P. 100 Great Time Management Ideas from successful executives and managers around the world Singapore: Marshall Cavendish; 2009. 2. Handbook on Time Management Skills for Public Managers: Centre for Good Governance; 2009. 3. Mancini M. Time Management: McGraw-Hill; 2003.				
Form of teaching	Lecture & workshop (2 UoI)				
Assessment method	Active participation, individual & group presentation, homework				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	None				

Requirements for receiving credit points	Passing the thesis and the presentation
Grading system	Pass/Fail

MATH102 – MATHEMATICS II

Module title	Mathematics II			**Module code**	MATH102
Duration	1 semester	**Semester**	Spring	**Module start**	2nd
Credit points	8 CP	**Workload**	240 h	**Contact hours**	96 h
				Individual study	144 h
Module coordinator	Prof. L. Altangerel			**Language**	English
Contents	• Series: numerical series, power series, Fourier series and Fourier transform; • Differential calculus of functions of several variables: convergence and continuity, partial derivatives, total differentiability, extreme value problems • Line integrals, integration over regions, surface integrals • Basics of ordinary and partial differential equations: modelling using differential equations, first and second order ordinary differential equations, system of ordinary differential equations, basic concepts of partial differential equations.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Demonstrate and apply the basic concepts of series; 2. Explain and calculate differential and calculus of functions of several variables. Be aware of their connections and potential applications in other fields. 3. Demonstrate and apply the basic concepts of ordinary and partial differential equations; 4. Make use of mathematical models to solve complex scientific and engineering problems .				
Literature	1. Stewart J, Clegg DK, Watson S. Solutions Manuals for Calculus Early Transcendentals. 9th ed.: -Cengage Learning ; 2020. 2. Thomas GB, Hass J, Heil C. Thomas' CALCULUS Early Transcendentals. 14th ed. Weidenaar J, editor.: Pearson; 2018. 3. Nagle RK, Saff EB, Snider AD. Fundamentals of Differential Equations. 9th ed. Weidenaar J, editor.: Pearson Education, Inc.; 2018.				
Form of teaching	Lecture (4 UoI) Recitation (4 UoI)				
Assessment method	Written examination (90 min.) and academic performance				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	Completion of Mathematics I recommended.				
Requirements for receiving credit points	Passing the module				

Grading system	The final grade consists of the academic performance during the module accounting for 70% and the module examination accounting for 30%.

MATS101 – MATERIALS SCIENCE

Module title	Materials Science			**Module code**	MATS101
Duration	1 semester	**Semester**	Spring	**Module start**	2nd
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	R. Nyamdulam			**Language**	English
Contents	• Introduction to Interatomic bonding Attractive and repulsive forces; Primary bonding, secondary bonding, and Van der Waals bonding • Introduction to Crystal Structures Crystalline and amorphous structures; single crystalline and polycrystalline materials, and crystal systems • Imperfection in Solids Chemical impurity; solid solution, point defect, linear defect, planar defect, volume defect • Mechanical properties Engineering stress, and engineering strain; Hooke's Law; Destructive, and Non-destructive testing techniques • Thermal behavior Heat capacity; Thermal expansion; Thermal conductivity, thermal shock • Phase Diagrams/ Phase Transformations Various phase regions; Compositions of phases; Binary phase equilibrium; Heat treatment processes; Kinetics of Phase transformation • Structural Materials Organic (Polymers and Composites) and Inorganic (Metals, Ceramics and glasses) materials, and their application • Electrical properties and Electronic Materials Conducting materials, insulators, semiconductors, and their application • Optical properties and Materials • Magnetic properties and Materials • Social and Environmental impact				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Describe the connection between atomic structure, and identify different types of crystal structures. 2. Describe the impacts of defects at the atomic and microstructure scales 3. Explain thermally activated processes, 4. Explain the significance of the main mechanical properties in relation to component design. 5. Explain the fundamentals of non-destructive testing. 6. Select materials in a responsible manner.				

	7. recognize and apply the significant properties for mechanically characterizing materials. 8. Explain diffusion processes. 9. Interpret states of phase equilibrium and non-equilibrium, understand the concepts of solid solution and solubility limits, and be able to define microscopic properties using the example of eutectic phase diagram. 10. Explain the qualities and quantifications of mechanical, thermal, electrical, optical, magnetic, and chemical properties.
Literature	1. Shackelford JF. Introduction to MATERIALS SCIENCE FOR ENGINEERS. 8th ed. Stark H, editor. New Jersey: Pearson Higher Education, Inc; 2015. 2. Callister WD, Rethwisch DG. Materials Science and Engineering: An Introduction. 9th ed. Sayre D, editor. New Jersey: Wiley; 2000. 3. Anderson JC, Leaver KD, Rawlings RD, Alexander JM. Materials Science. 4th ed. Singapore: Springer-Science+Business Media, B.V.; 1990.
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)
Assessment method	Written examination (120 min.) and academic performance
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering
Prerequisites for participation	Knowledge of the modules Chemistry and Physics
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.

ENME101 – ENGINEERING MECHANICS I (STATICS)

Module title	Engineering Mechanics I (Statics)			**Module code**	ENME101
Duration	1 semester	**Semester**	Spring	**Module start**	2nd
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. Sungchil Lee			**Language**	English
Contents	General systems of forces. Equilibrium of rigid body. Reaction forces at structural supports. Moment by forces. Structural analysis of truss, beams, frame structures. Center of mass, area, volume. Virtual work principle. Friction. Stability of column structure.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Explain the concept of force, moment, and equilibrium state in Statics. 2. Establish equilibrium equations and solve statically determinate structures. 3. Compute support reaction forces in statically determinate systems by means of equilibrium conditions or the principle of virtual work. 4. Compute internal forces in beam and truss structures and discuss the effects of external forces on structures. 5. Use shear force diagram and bending moment diagram to interpret the effect of external forces on structures. 6. Compute the center of mass, volume, and area. 7. Apply Pappus principle to calculate volume and surface area of revolving objects. 8. Classify friction type in simple machines and compute proper friction forces.				
Literature	1. Gross D, Hauger W, Schroder J, Wall WA, Rajapakse N. Engineering Mechanics 1 Statics: Solutions to Supplementary Problems. 2nd ed.; 2012. 2. Meriam JL, Kraige LG. Engineering Mechanics Volume 1 Statics. 7th ed. Hoboken, NJ: John Wiley & Sons, Inc.; 2012.				
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)				
Assessment method	Written examination (120 min.) and academic performance				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	Completion of Mathematics I recommended.				

Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.

PHYS101 – PHYSICS

Module title	Physics			**Module code**	PHYS101
Duration	1 semester	**Semester**	Spring	**Module start**	2nd
Credit points	6 CP	**Workload**	180 h	**Contact hours**	72 h
				Individual study	108 h
Module coordinator	Prof. N. Battulga			**Language**	English
Contents	**Statics:** • Vector operations, Torque **Kinematics:** • projectile motion, uniform circular motion, centripetal acceleration **Dynamics:** • Newton's Laws and their applications, principle of conservation of momentum **Energy and Work:** • Kinetic and Potential energy, Conservation of Energy **Fluid mechanics:** • Fluid Properties, Fluid flows **Electricity:** • Electric field of a point charge, Electric potential, Capacitors and capacitance, Electric current, Potential difference, Resistance and resistivity **Oscillations**: • Simple harmonic motion, Energy in simple harmonic motion				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Demonstrate vector operations, torque, Newton's Laws, conservation of momentum and energy in various practical problems. 2. Determine different types of fluid flows, and fluid properties 3. Calculate the electric potential, eapacitors and capacitance, electric current, potential difference, resistance and resistivity. 4. Demonstrate simple harmonic motion, and related energy in various practical problems				
Literature	1. Young HD, Freedman RA. University Physics with Modern Physics. 14th ed.: Pearson Education; 2015. 2. Walker J. Fundamentals of physics. 10th ed. Hoboken, NJ: John Wiley and Sons, Inc.; 2014. 3. Wilson JD, Hernández-Hall CA. Physics Laboratory Experiments. 8th ed.: Brooks Cole; 2014. 4. Serway RA, Jewett JW. Physics for Scientists and Engineers with Modern Physics. 9th ed.: Cengage Learning; 2013.				
Form of teaching	Lecture (1 UoI) Recitation (1 UoI) Laboratory (4 UoI)				
Assessment method	Written examination (60 min.) and academic performance				

Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering
Prerequisites for participation	Completion of Mathematics I recommended.
Requirements for receiving credit points	Passing the module “Physics laboratory” is a prerequisite for the participation of the final module examination
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.

CHEM102 – CHEMISTRY LABORATORY

Module title	Chemistry Laboratory			**Module code**	CHEM102
Duration	1 semester	**Semester**	Spring	**Module-start**	2nd
Credit points	3 CP	**Workload**	90 h	**Contact hours**	36 h
				Individual study	54 h
Module coordinator	J. Bayardulam			**Language**	English
Contents	Selected experiments in the fields of general chemistry, analytical chemistry and electrochemistry: unaided acquisition of knowledge, colloquia and written reports. <u>Laboratory practical work</u> ● Properties of matter – boiling point ● Reaction of magnesium and calcium with water – hydroxide ● Quantitative analysis of oxides and properties of mixture ● Formation of salts by reaction of metals with acids ● Detection of an acidic reaction with various indicators ● Estimation of copper by colorimetric method ● Electrolysis of water ● Rate of chemical reaction ● Electrochemical cell ● Observing Chemical Equilibrium ● Precipitates and Solubility Rules ● Hess's law				
Learning outcomes	On successful completion of this module, the students should be able to: 1. apply simple working procedures in the laboratory. 2. Determine physical and safety-related data for materials, and interpret it in context. 3. use experimental equipment in accordance with the safety regulations, and carry out experiments. 4. work together in small groups. 5. prepare a technical report on an experiment and present the results of the experiment in a suitable form. 6. use technical terms and expressions in English .				
Literature	1. Allan BJ. Laboratory Manual for Principles of General Chemistry. 10th ed.: Wiley; 2014. 2. Atkins JL. Chemical Principles. 6th ed.: W.H. Freeman and Company; 2013. 3. Brown L, Holme T. Chemistry for Engineering Students. 2nd ed.: Brooks Cole; 2010.				
Form of teaching	Laboratory (3 UoI)				

Assessment methods	Pre-lab questions before conducting lab experiments, and post-lab defense and written documentation (lab reports) after the experiment. Midterm exams after completing 6 modules each.
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy & Electrical Engineering B.Sc. Mechatronic Engineering
Prerequisites for participation	None
Requirements for receiving credit points	Passing the module
Grading system	The Lab grade consists of the lab performance (including prelab, participation in experiments and lab report defense) during the module accounting for 70% and the final examination accounting for 30%

BAEM101 – INTRODUCTION TO BUSINESS ADMINISTRATION AND ENGINEERING MANAGEMENT

Module title	Introduction to Business Administration and Engineering Management			**Module code**	BAEM101
Duration	1 semester	**Semester**	Spring	**Module start**	2nd
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. Ch. Enkhzaya			**Language**	English
Contents	Students will be introduced to basic principles of business administration. In addition, the module prepares students for courses to come in engineering management. Business administration studies problems within the firm and relates to problems in the fields of production organization, strategy, marketing and logistics, finance and accounting, and information management: 1. History and state of the art of business administration as a discipline (fundamentals, managing, and performing, technology-driven management) 2. Why do firms exist? (causes and goals of firms, the structure of a firm, business environment) 3. How to manage processes, teams and firms? 4. Constitutive decisions 5. Production 6. Basics of marketing and sales 7. Investment and Financing 8. Business Accounting 9. Managerial communication Additionally, the Module should enable the students to understand the specifics of the private sector - function and structure - in Mongolia				
Learning outcomes	On successful completion of this module, the students should be able to: • Remember and understand what is this discipline about. • Describe the boundaries of the discipline towards other disciplines like e.g. macro economy or natural sciences • Explain the principles on which firms exist and make decisions • Identify various fields of the firm's activities • Understand the legal environment in which firms operate • Analyze core functions of firms by breaking them into constituent parts (purchase, production, sales and marketing, HR, operations and controlling, etc.), and by determining how the parts relate to one another • Evaluate the performance of firms according to criteria and standards • Develop or create solutions for general managerial tasks				
Literature	1. Wöhe. Einführung in die Allgemeine Betriebswirtschaftslehre. 27th ed.: Vahlen, Munich; 2020. 2. Bauer T, Erdogan B, Short J. Principles of Management v. 4.0: Boston Academic Publishing; 2019.				

	3 Robbins SP, Coulter M. Management. 11th ed.: Pearson; 2012. .
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)
Assessment method	Written examination (90 min) – optimally based on a case study from the technology world; and academic performance (report and oral presentation and attendance)
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering
Prerequisites for participation	None
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounted for 30% (incl. term paper and midterm exam) and the module examination accounted for 70%

ENME201 – ENGINEERING MECHANICS II (DYNAMICS)

Module title	Engineering Mechanics II (Dynamics)			**Module code**	ENME201
Duration	1 semester	**Semester**	Fall	**Module start**	3rd
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. Sungchil Lee			**Language**	English
Contents	Kinematics of particles and rigid body. Coordinate systems in Dynamics. Physical quantities in various coordinate systems. Projectile motion. Kinetics of particles and rigid bodies. Work and energy of particle and rigid body. Linear momentum and impulse of particle and rigid body. Angular momentum and impulse of rigid body.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Describe planar and spatial motions of particle and rigid bodies using coordinate systems. 2. Formulate dynamic problems into equation of motion applying the Newton´s law of motion. 3. Calculate acceleration, velocity of moving objects applying work and energy concept. 4. Calculate motion of rigid body applying angular momentum and impulse. 5. Integrate the principles of Dynamics and Statics to formulate engineering problems. 6. Distinguish the difference between linear and angular momentum and impulse theory and solve dynamic problems.				
Literature	1. Gross D, Hauger W, Schröder J, Wolfgang A. Wall, Sanjay Govindjee. Engineering Mechanics 3: Dynamics. 2nd ed.: Springer-Verlag Berlin Heidelberg; 2014. 2. Kraige LG, Meriam JL. Dynamics. 7th ed.: Wiley; 2013.				
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)				
Assessment method	Written examination (90 min.) and academic performance				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	Mathematics I, Engineering Mechanics I (Statics) recommended				
Requirements for receiving credit points	Passing the module				
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.				

STAT201 – INTRODUCTION TO STATISTICS

Module title	Introduction to Statistics			**Module code**	STAT201
Duration	1 semester	**Semester**	Fall	**Module start**	3rd
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	G. Dorjsundui			**Language**	English
Contents	The module has two strongly related parts as probability and statistics. The first part covers an introduction to probability and random variables. Topics include distribution functions, binomial, geometric, hypergeometric, and Poisson distributions. The other topics covered are uniform, exponential, normal, gamma and beta distributions; conditional probability; Bayes theorem; joint distributions; law of large numbers; and central limit theorem. The second part offers an in-depth theoretical and practical foundation for statistical methods that are useful in many applications. The goal is to understand the role of statistical thinking in the engineering field				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Have fundamental approaches of probability calculation and conceptual definitions. 2. Set up and work with discrete and continuous random variables. In particular, understand the Bernoulli, binomial, geometric, Poisson distributions, uniform, normal and exponential distributions. 3. Know what expectation and variance mean and be able to compute them and extend the convergence of statistical inference. 4. Explain and interpret the quantitative data as descriptive statistical results including tables and graphs. 5. Understand the difference between probability and likelihood functions, and find the maximum likelihood estimate for a model parameter with basic confidence intervals. 6. Demonstrate null hypothesis significance testing to test the significance of results, and understand and compute the p-value for these tests. 7. Compute and interpret simple linear regression between two variables .				
Literature	1. Mario TF. Elementary Statistics. 13th ed.: Pearson; 2018. 2. Moonjung C, Wendy ML. Statistics in MATLAB: A Primer: CRC Press; 2014. 3. Walpole RE, Myers RH, Myers Sl, Ye KE. Probability and Statistics for Engineers and Scientists. 9th ed.: Pearson; 2012. 4. Ott L, Longnecker M. An Introduction to Statistical Methods and Data Analysis. 6th ed.: Brooks/Cole; 2010. 5. Navidi W. Statistics for Engineers and Scientists . 3rd ed.: McGraw-Hill Science/Engineering/Math; 2010. 6. Ross S. A First Course in Probability . 8th ed.: Pearson Prentice Hall; 2009. 7. Bertsekas DP, Tsitsiklis JN. Introduction to Probability: MIT; 2000.				
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)				

Assessment method	Written examination (90 min.) and academic performance
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering
Prerequisites for participation	Mathematics II
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 70% and the module examination accounting for 30%.

THER201 – ENGINEERING THERMODYNAMICS

Module title	Engineering Thermodynamics			**Module code**	THER201
Duration	1 semester	**Semester**	Fall	**Module start**	3rd
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. B. Battsengel			**Language**	English
Contents	Fundamental terms of thermodynamics; thermodynamic equilibrium and temperature; different forms of energy (internal energy, heat, work, enthalpy); properties and equations of state for gases and incompressible substances; first law of thermodynamics and energy balances for technical systems; second law of thermodynamics and entropy balances for technical systems; exergy analysis; thermodynamics of phase changes; the Carnot cycle for power generation or refrigeration; energy efficiency and coefficient of performance; cyclic processes for gas turbines, combustion engines, power plants, refrigerators and heat pumps				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Explain the relationships between thermodynamic properties and the thermodynamic state of a system, and apply them in calculating a thermal system behavior. 2. Distinguish between different types of energy (e.g. work, heat, internal energy and enthalpy) and define them. 3. Analyze technical systems and processes using energy balances and equations of state. 4. Assess energy conversion processes by means of an exergy analysis. 5. Characterize the thermal behavior of gases, liquids and solids, and corresponding phase change processes. 6. Apply this basic knowledge (1.-5.) to examine machines (turbines, pumps etc.) and processes for energy conversion (combustion engines, power plants, refrigerators, heat pumps).				
Literature	1. Koretsky MD. Engineering and Chemical Thermodynamics. 2nd ed.: Wiley; 2012. 2. Çengel YA, Boles MA. Thermodynamics: An Engineering Approach. 8th ed.: McGraw-Hill Education; 2011.				
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)				
Assessment method	Written examination (90 min.) and academic performance				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				

Prerequisites for participation	None
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.

DESN201 – ENGINEERING DESIGN

Module title	Engineering Design			**Module code**	DESN201
Duration	1 semester	**Semester**	Fall	**Module start**	3rd
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. Sungchil Lee			**Language**	English
Contents	Drawing letters and numbers. Drawing polygon and ellipse. Isometric projection. Orthographic projection. Perspective projection. Oblique projection. Dimensions. Gears and Cams. Tolerance. Geometric tolerance. Mechanical design concept.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Draw alphabets and numbers following the engineering drawing custom. 2. Draw bisect line, perpendicular line, bisect angle line. 3. Make drawings of objects using isometric projection, orthographic projection, oblique projection, and perspective projection. 4. Interpret drawings of multi-view projection of objects and draw them using isometric projection. 5. Draw cam profile based on the cam drawing. 6. Explain gear parts and calculate gear shape. 7. Interpret and make tolerance drawing and geometric tolerance drawing. 8. Model mechanical drawing of parts.				
Literature	1 Giesecke et al. Technical drawings with engineering graphics. 14th ed.: Pearson; . 2014. 2 Mott RL. Machine Elements in Mechanical Design. 4th ed.: Prentice Hall; 2004. .				
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)				
Assessment method	Written examination (120 min.) and academic performance				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	None				
Requirements for receiving credit points	Passing the module				

Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.

ELEC201 – INTRODUCTION TO ELECTRICAL ENGINEERING

Module title	Introduction to Electrical Engineering			**Module code**	ELEC201
Duration	1 semester	**Semester**	Fall	**Module start**	3rd
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. P. Ariunbolor			**Language**	English
Contents	Electrical charge, electrical current, electrical voltage and power, linear DC circuits, Ohm's law, Kirchhoff rules, ideal and real sources, electrical field, capacitor, electrostatic forces, capacitors in linear networks, magnetic field, Lorentz force, Ohm's law of the magnetic network, Ampere's circuital law, ferromagnetism, induction, self-inductance, inductors in linear networks, basic of electric machines and electric safety and power supply system				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Use electrical quantities and units. 2. Calculate linear DC circuits. 3. Calculate work, power, and energy. 4. Analyze and calculate simple linear AC circuits. 5. Design simple electronic circuits 6. Apply the knowledge of electric safety.				
Literature	1 Theraja BL, Theraja AK. A Textbook of Electrical Technology in SI Units. Volume I: . Basic Electrical Engineering: S Chand & Co Ltd; 1999. 2 Cathey JJ, Nasar SA. Schaum's Outline Series Theory and Problems of Basic . Electrical Engineering: McGraw-Hill; 1983.				
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)				
Assessment method	Written examination (90 min.) and oral examination for documentation and presentation (10-30 min. per each student				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	Completion of Mathematics I is recommended				
Requirements for receiving credit points	Passing the module				
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.				

MINE201 – INTRODUCTION TO MINING

Module title	Introduction to Mining			**Module code**	MINE201
Duration	1 semester	**Semester**	Fall	**Module start**	3rd
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. T. Hollenberg			**Language**	English
Contents	The course aims to support students in acquiring the knowledge about extraction of raw materials and the influence of the mining industry on the development of resource rich countries through mining, processing and value adding. • Market economics • Prospection and Exploration, Deposit assessment • Ground mechanics • Equipment Selection and Requirements • Mining method selection • Surface Opening and Development • Surface Ore Handling Techniques • Surface Mining Operations and Variations • Underground Development • Underground Ore Handling Techniques • Underground Mining Operations and Variations • Hydraulic and Pipeline Mining • Shallow and Deep Drilling • Mineral processing • Mining and Environment • Community and social issues				
Learning outcomes	Upon successful completion of this module, students will, through assessment activities, show evidence of their ability to: 1. Analyze different raw material deposits and evaluate the economic value. 2. Identify the principles of the technologies and apply selection methods for mining operations. 3. Plan and design mining operations and choose appropriate technologies for given circumstances. 4. Recognize the machines and technologies used in open pit and underground mining. 5. Calculate the main parameters of simple technological chains .				
Literature	1. Kuchta HWA, Martin M, Randall K. Open Pit Mine Planning and Design, Two Volume Set & CD-ROM Pack, Third Edition. 3rd ed.: CRC Press; 2013. 2. Peter D. SME mining engineering handbook. 3rd ed.: Society for Mining, Metallurgy, and Exploration; 2011. 3. Milojcic G, Asmus SC, Thielemann T, Ernst H. Christian Niemann-Delius, Rolf Dieter Stoll, Carsten Drebenstedt, Klaus Müllensiefen. Der Braunkohlentagebau: Bedeutung, Planung, Betrieb, Technik, Umwelt. 1st ed.: Springer-Verlag Berlin Heidelberg; 2009. 4. Howard HL. Introductory Mining Engineering. 2nd ed.: Wiley; 2007.				
Form of teaching	Lecture (4 UoI)				
Assessment method	Written examination (90 min.) and academic performance				

Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering
Prerequisites for participation	Basic knowledge of mathematics and natural science
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.

ECON201 – INTRODUCTION TO ECONOMICS

Module title	Introduction to Economics			**Module code**	ECON201
Duration	1 semester	**Semester**	Fall	**Module start**	3rd
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Dr. P. Bolormaa			**Language**	English
Contents	This module provides: ● Introduction: What is economics, Economic Problem ● How market works: Demand and Supply, Market Equilibrium, Elasticity, Markets in Action ● Firms and Markets: Organizing Production, Output and Costs, Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly ● Factor Markets: Markets for factors of production such as labor market and capital market				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Explain big questions of economics and key ideas that define the economic way of thinking; 2. Describe a competitive market, explain the influences on demand and supply, explain how demand and supply determine market equilibrium. 3. Calculate and explain the factors that influence the elasticities of demand and supply. 4. Explain what a firm is and describe the economic problems that all firms face, describe and distinguish between different types of markets in which firm operates. 5. Explain the relationship between a firm's output and labor employed in the short run, explain the relationship between a firm's output and costs in the short run and derive a firm's short-run cost curves, and explain the relationship between a firm's output and costs in the long run and derive a firm's long-run average. 6. Define perfect competition, monopoly, monopolistic competition and oligopoly, explain how firms make their supply decisions in these markets, and why perfect competition is efficient and why others are inefficient. 7. Explain the link between a factor price and factor income, explain what determines demand, supply, the wage rate, and employment in a competitive labor market, and explain what determines demand, supply, the interest rate, saving, and investment in the capital market.				
Literature	1. Parkin M. Economics. 12th ed.: Pearson; 2015. 2. Mankiw NG. Principles of Economics. 7th ed.: Cengage Learning; 2014. 3. Atkinson B, Miller R. Business Economics: Addison Wesley; 1998.				
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)				
Assessment method	Written examination (90 min.) and academic performance				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	None				

Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.

MEAS201 – MEASUREMENT, INSTRUMENTATION AND CONTROL BASICS

Module title	Measurement, Instrumentation and Control Basics			**Module code**	MEAS201
Duration	1 semester	**Semester**	Spring	**Module start**	4th
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. P. Ariunbolor			**Language**	English
Contents	• Measurement technology: physical significance, measuring arrangement, measurement chain, errors, the main procedures for measuring temperature, pressure, flow and filling levels • Data-processing technology: measuring transducers, measured value boards (hardware), measurement software, processing and analysis programs • Regulator technology: product-integrated regulators, autonomous regulators (industry standard regulators), compact regulator stations, programmable regulator stations • Process control technology: signal/packet-based data transmission, bus systems, transmission paths, coupling stations, engineering stations, software process manager, MES, ERP				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Demonstrate the physical principles of measurement and recognize the process relationships in specific application examples. 2. Describe the digital processing of measurements. 3. Describe the operating method of control and regulating equipment, and set up the parameters of these devices. 4. Assess the options for optimizing automation equipment and evaluate existing automation systems.				
Literature	1. Rossi GB. Measurement and Probability: A Probabilistic Theory of Measurement with Applications : Springer; 2014. 2. Rossi GB, Huang S, Wang S. Springer Series in Measurement Science and Technology: Springer; 2014. 3. Hebra A. The Physics of Metrology: Springer; 2010. 4. Kimothi SK. Uncertainty of Measurements: Physical and Chemical Metrology. 1st ed.: Asq Pr; 2002. 5. Pennella CR. Managing the Metrology System. 2nd ed.: Amer Society for Quality; 1997.				
Form of teaching	Lecture (2 UoI) Recitation (1 UoI) Laboratory (1 UoI)				
Assessment method	Written (90 min.) and oral (30 min.) examination and academic performance				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering				

	B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering
Prerequisites for participation	Completion of Introduction to Electrical Engineering, Mathematics I and II and Physics recommended.
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.

CAD201 – COMPUTER AIDED DESIGN (CAD)

Module title	Computer Aided Design (CAD)			**Module code**	CAD201
Duration	1 semester	**Semester**	Spring	**Module start**	4th
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. Sungchil Lee			**Language**	English
Contents	Development of CAD software. Environment of AutoCAD. Basic drawing commands: line, circle, polygon, etc. Modification commands: copy, move, trim, extends, join, break, array, insert, etc. Text commands. Miscellaneous commands. Dimensions. Geometric tolerance. Hatching. Layers. Blocks. Drawing mechanical parts. Drawing multi-view projections of object. Design mechanical parts.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Draw basic geometrics: line, circle, rectangle, etc. 2. Edit drawings using modification commands. 3. Apply each line style appropriately in drawings. 4. Draw dimensions and modify existing dimensions. 5. Interpret and make general tolerance and geometric tolerance 6. Utilize layers to draw efficiently. 7. Make and save blocks and utilize them in drawing. 8. Criticize mechanical drawings.				
Literature	1. Dix M, Riley P. Discovering AutoCAD. 1st ed.: Pearson; 2015. 2. Lang K. AutoCAD Tutor for Engineering Graphics. 1st ed.: Cengage Learning; 2013.				
Form of teaching	Lecture (1 UoI) Laboratory (3 UoI)				
Assessment method	Drawing using AutoCAD software (30 min) and academic performance				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	Completion of Engineering Design recommended.				
Requirements for receiving credit points	Passing the module				
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.				

FLME201 – FLUID MECHANICS

Module title	Fluid Mechanics			**Module code**	FLME201
Duration	1 semester	**Semester**	Spring	**Module start**	4th
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. N. Battulga			**Language**	English
Contents	• Basic concepts in fluid mechanics, such as continuum, velocity field, and vorticity. • Dimensional analysis • Principle of the mass conservation and the Newton's law to describe the fluid motion and solve basic engineering problems. • Fluid motion for inviscid fluids, internal flows (e.g. pipe flows), external flows (airfoils and bluff bodies), and flows with a free surface.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Calculate fluid flow regimes, including laminar vs turbulent flows; boundary layers and velocity profiles; 2. Apply Dimensional Analysis techniques; 3. Compute basic hydrostatics problems involving manometers and submerged surfaces. 4. Demonstrate the concept of continuity, 5. Demonstrate Bernoulli's principle, and apply it in flow measurement (orifice and Venturi meter, Pitot-static tube), and to a variety of problems involving area change and height change. 6. Solve basic problems involving pressure losses through pipes and pipe bends and fittings. 7. Apply Momentum equation and the concept of a control volume. Use the equation to calculate impulse and reaction forces due to the interaction of a fluid stream with objects, and pressure drops.				
Literature	1. Elger DF, Crowe CT , Roberson JA, Williams BC. Engineering Fluid Mechanics. 10th ed.: Wiley; 2012.				
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)				
Assessment method	Written examination (120 min.) and academic performance				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	PHY101, THER220,				

Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.

RREC201 – RAW MATERIALS AND RECYCLING

Module title	Raw Materials and Recycling			**Module code**	RREC201
Duration	1 semester	**Semester**	Spring	**Module start**	4th
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Dr. T. Narangarav			**Language**	English
Contents	The technical and legal principles will be covered in relation to selected topics in raw material management and recycling: ● Legal principles (material-specific and country-specific). ● Quantities of waste material and primary raw material. ● Raw material prices and recycling costs. ● The market for secondary raw materials. ● Quality requirements, and basic technical principles. ● Examples of recycling processes. ● Current legal requirements, and the effects and repercussions upon trade, industry, and local authorities. ● Demonstration of various different economic measures for recycling by means of practical examples. Cycles will be considered in the following industrial sectors: iron and steel, non-ferrous metals, mineral raw materials, and wood.				
Learning outcomes	On successful completion of this module, students should be able to: 1. Describe the technical and economic principles of lifecycle economy, recycling, and the identification and remediation of contaminated sites. 2. Explain the technical relationships, the differences between free and regulated markets, and the controlling function of the legal system in recycling, and the remediation of contaminated sites. 3. Apply the gained knowledge by carrying out a piece of independent practical work, and publicly presenting their knowledge and experience of complex technical/economic/legal matters.				
Literature	1. Pichtel J. Waste Management Practices: Municipal, Hazardous, and Industrial. 2nd ed.: CRC Press; 2014. 2. Bilitewski B, Härdtle G, Marek K. Waste Management. 1st ed.: Springer; 2010. 3. Bagchi A. Design of Landfills and Integrated Solid Waste Management. 2nd ed.: Wiley; 2004. 4. Rowe DR, Abdel-Magid IM. Handbook of Wastewater Reclamation and Reuse. 1st ed.: CRC Press; 1995.				
Form of teaching	Lecture (2 UoI) Recitation/Field trip (2 UoI))				
Assessment method	Written examination (60 min) and academic performance				

Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering
Prerequisites for participation	None
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 50% and the module examination accounting for 50%.

SCIM201 – SCIENTIFIC METHODS

Module title	Scientific Methods			**Module code**	SCIM201
Duration	1 semester	**Semester**	Spring	**Module start**	4th
Credit points	2 CP	**Workload**	60 h	**Contact hours**	24 h
				Individual study	36 h
Module coordinator	Prof. L. Altangerel			**Language**	English
Contents	This topic introduces students to the broad quantitative and qualitative approaches to research in the field of education. Students examine the key steps in the process of conducting research including identifying research problems, reviewing the literature, developing research questions, collecting and analyzing data, and reporting and evaluating research. Students are asked to consider the context, nature and purposes of research in selecting a research method. Students are encouraged to integrate their research interest in their learning process. The module aims to ● Introduce to a range of approaches to scientific research and relationship to philosophical thinking; ● Critically examine the similarities and differences between quantitative and qualitative research works and their effect on research method selection; ● Develop an understanding of the key elements of the research process including: research problems, literature, reviews, research questions, collecting and analyzing data as well as reporting and evaluating research				
Learning outcomes	On successful completion of this module, students should be able to: 1. Identify and describe a variety of approaches to research, their similarities and differences, and arguments for and against the use of each approach. 2. Develop an understanding of the key elements of the research process including research problems, literature reviews, research questions, collecting and analyzing data; and reporting and evaluating research. 3. Understand scientific research papers and recognize articles that addresses an area of research from different philosophical perspectives. 4. Identify original contributions to research, to policy and/or management and/or practice. 5. Carry out independently a small-scale research.				
Literature	1. Deb D, Dey R, Balas WE. Engineering Research Methodology. 1st ed.: Springer; 2019. 2. Ormrod LPD, Ellis J. Practical research : planning and design. 11th ed.: Pearson; 2015. 3. Kumar R. Research Methodology. 3rd ed.: SAGE Publications; 2010.				
Form of teaching	Recitation (2 UoI)				
Assessment method	Academic performance and final presentation, report				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				

Prerequisites for participation	None
Requirements for receiving credit points	Passing the module
Grading system	Pass/Fail

HSE201 – HEALTH SAFETY ENVIRONMENT (HSE)

Module title	Health Safety Environment (HSE)			**Module code**	HSE201
Duration	1 semester	**Semester**	Spring	**Module start**	4th
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	B. Erdenebaatar			**Language**	English
Contents	a. Principles of Health/Safety/Environment Management (HSE) History, terminology, basis, duties and quality goals of HSE; overview of national and international law, sustainability model/indicators; principles of complex working systems, cause and effect model, risk reduction model, regional material flow and area management, operational material flow management; health/safety/environmental technology, working environment, organization and human behavior; overview, selected risks and stresses, emissions and immissions; event statistics, environmental auditing, environmental compatibility, environmental declaration, environmental performance assessment, principles of ecological life cycle balancing, principles for constructing and implementing management systems (PDCA cycle) b. Methods for Health/Safety/Environment Management Assessment of HSE effects (basis and methods for form-based assessment, determination and evaluation of risks and stresses, analysis methods); hierarchy of protective measures, key performance indicators (KPIs), ecological book-keeping, estimation of technical consequences, methods for quantifying the environmental relevance of emissions and immissions, audits, continuous improvement process, etc.); prevention, operation with goals, influencing behavior, environmental cost calculation, eco-cost control; Certification of management systems (e.g. EMAS, EN ISO 14001 ff., EN ISO 9001 ff., OHSAS 18001 ff.), integrated management system				
Learning outcomes	On successful completion of this module, students should be able to: 1. Describe the basic scientific principles, methods and instruments for protection of the workplace, health and the environment, and sustainability management, and to apply the requirements of the standards to selected operational examples. 2. List the risks and stress factors and evaluate emissions and immissions. 3. Analyze complex work systems in terms of the causal chain (cause-effect-damage) and select protective measures. 4. Describe the structure, Contents and goals of the main HSE management systems, describe the duties of the technical and managerial personnel in terms of analysis, organization and activities				
Literature	1. Center for the Advancement of Process. Safety, Health & Environment: Prentice Hal; 2009.				
Form of teaching	Lecture (2 UoI) Recitation (1 UoI) Field trip (1 UoI)				
Assessment method	Written examination (90 min.) and academic performance				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				

Prerequisites for participation	None
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.

LAW201 – LAW

Module title	Law			**Module code**	LAW201
Duration	1 semester	**Semester**	Spring	**Module start**	4th
Credit points	2 CP	**Workload**	60 h	**Contact hours**	24 h
				Individual study	36 h
Module coordinator	G. Surakhbayar			**Language**	English
Contents	This module introduces students to the basics of national and international environmental law. Including: • Overview of Environmental Concepts, Theories, Sources; • Protecting Environmental Objects such as Air, Water, and Wildlife in Mongolia • International Environmental Norms				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Describe the roles of contemporary theories, concepts, and sources concerning environmental protection. 2. Examine the importance of environmental laws & regulations and its application within the Mongolian court system. 3. Assess interactions between environmental laws & regulations and other domestic laws. 4. Apply environmental rules and norms to specific environmental issues in Mongolia.				
Literature	1. Amarkhuu O. Contemporary Environmental Law of Mongolia; 2013. 2. Percival RV, Schroeder CH, Miller AS, James P. Leape. Environmental Regulation: Law, Science, and Policy. 7th ed.: Wolters Kluwer; 2013. 3. Hunter D, Salzman J, Zaelke D. International Environmental Law and Policy. 4th ed.: Foundation Press; 2010.				
Form of teaching	Lecture (2 UoI)				
Assessment method	Written examination (90 min.) and academic performance.				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	None				
Requirements for receiving credit points	Passing the module				
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.				

INTR201 – BASIC INTERNSHIP

Module title	Basic Internship			**Module code**	INTR201
Duration	1 semester	**Semester**	Spring	**Module start**	4th
Credit points	2 CP	**Workload**	120 h	**Contact hours**	NA
				Individual study	120 h
Module coordinator	Department of Academic and Student Affairs			**Language**	English
Contents	During the internship, students will be introduced to the social structures in the company, work processes, the relationship between employees, supervisors and executives, and teamwork as well as the responsibility of the individual employee. The Basic Internship helps the students to decide on a major or confirm the decision they have already made.				
Learning outcomes	After taking part in the industrial placement, the student should be able to: 1. Explain the company structure and its work processes. 2. Describe the duties and tasks of positions in the company. 3. Do simple SWAT analysis for the company. 4. Provide a written statement of the activities carried out, an appropriately record their observations and experiences.				
Literature	None				
Form of teaching	Basic internship (6 weeks)				
Assessment method	Written report (min. 10 p.)				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	None				
Requirements for receiving credit points	Confirmation of participation in the internship, Acceptance of the written report.				
Grading system	Pass / Fail				

PROFESSIONAL MODULES (5TH - 8TH SEMESTER)

INDE301 – PROJECT MANAGEMENT

Module title	Project Management			**Module code**	INDE301
Duration	1 semester	**Semester**	Fall	**Module start**	5th
Credit points	6 CP	**Workload**	180 h	**Contact hours**	48 h
				Individual study	132 h
Module coordinator	Prof. Ch. Enkhzaya			**Language**	English

Contents

Project Management has become one of the most popular tools for both public and private organizations to improve internal operations, to respond rapidly to external opportunities, to achieve technological breakthroughs, to streamline new product development and to more robustly manage the challenges arising from the business environment.

Outline:

- What is a Project?
- What is Project Management?
- Project and its environment
- Project Phases:
  - Project Selection and Design
  - Project Planning
  - Project Implementation
  - Project Evaluation and Control
  - Project Close-Out and Termination
- Project Management Dimension:
  - Leadership and the Project Manager
  - Team Building, Conflict and Negotiation
  - Risk Management
  - Cost Estimation and Budgeting
  - Resource Management.

Learning outcomes

On successful completion of this module, the students should be able to:

1. Recall specifics of a project compared to business as usual,
2. Identify different project phases, name their main pattern and interconnection,
3. Understand and apply tools and instruments of project design, planning, implementation and monitoring.
4. Analyse tasks and questions in project management,
5. Structure them and develop solution alternatives by abstracting in concrete situations.
6. Apply project management techniques for organizational problems.

Literature

1. Project Management Institute. A Guide to the Project Management Body of Knowledge. 7th Edition. Project Management Institute; 2021.
2. Pinto JK. Project Management: Achieving Competitive Advantage. 5th edition. Harlow-Pearson Education; 2015.
3. Kogon K, Blakemore S, Wood J. Project Management for the Unofficial Project Manager. BenBella Book; 2015.

Form of teaching

Lecture (1 UoI)
Recitation (2 UoI)

	Field trip (1 UoI)
Assessment method	Written examination (60 mins), oral examination (90 mins) and academic performance
Associated study program	B.Sc. Industrial Engineering
Prerequisites for participation	Introduction to BA and EM, Introduction to Economics
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module, accounting for 70%, and the module examinations accounting for 30%

INDE302 – INTRODUCTION TO ACCOUNTING

Module title	Introduction to Accounting			**Module code**	INDE302
Duration	1 semester	**Semester**	Fall	**Module start**	5th
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module Coordinator	Sh. Urtnasan			**Language**	English
Contents	This module introduces the student to the basics of accounting and will serve to develop a firm foundation for the fundamental financial accounting procedures that will be covered in related modules to come. Students are exposed to both the theoretical and practical aspects of accounting as the language of business, and they should be able to outline the importance of accounting and budgeting to the development of an organization. Outline: • Accounting information and business • Accounting and its role in business • Financial statements • Revenues, costs and profit planning • Recording and communicating in the accounting cycle • Recording and communicating in the expenditure cycle • Recording and communicating in the revenue cycle • Analysis of revenue and expenditure cycle • Income taxes' accounting • Investing and operational activities • Performance: profitability • Performance: financial position • Performance: cash flows • Performance: comprehensive evaluation				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Analyze, record and summarize basic business transactions, 2. Utilize a worksheet to summarize adjustments, to prepare basic financial statements for a service-oriented manufacturing enterprise, and to prepare closing entries. 3. Prepare bank reconciliations, and calculate a payroll. 4. Grasp the basics of accounting for a merchandising business (buying and selling transactions) and the complete accounting cycle for merchandising entities. 5. Use accounting information in an informative way, to have a basic understanding of how the activities of an organization are reflected in the financial statements 6. Explain the basic terms and Contents of financial statements.				
Literature	1. Ainsworth P, Deines D. Introduction to Accounting: An integrated Approach. 8th edition. John Wiley & Sons Inc; 2019.				
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)				
Assessment method	Written examination (90 min.) and academic performance.				
Associated study program	B.Sc. Industrial Engineering				
Prerequisites for participation	Introduction to BA and EM, Introduction to Economics				

Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.

INDE303 – OPERATIONS MANAGEMENT

Module title	Operations Management			**Module code**	INDE303
Duration	1 semester	**Semester**	Spring	**Module start**	5th
Credit points	6 CP	**Workload**	180 h	**Contact hours**	48 h
				Individual study	132 h
Module coordinator	Gerhard Wackenhut			**Language**	English

Contents

This course provides a general management perspective of the role of operations in companies in both manufacturing and service industries. It offers a broad survey of the concepts and techniques involved in designing and managing business operations.

The course explains the role of operations in building the competitive strength of the company and in fulfilling its goal of creating value and delivering customer satisfaction. Focus is on the leading decisions operations managers must make within the wider corporate and industry context, from production inputs, process design to inventory and quality management, maintenance and development over time. The course consists of three main parts: designing operations, managing operations and monitoring assessment, where operation managers make decisions to execute the planned actions.

The first part provides a broad introduction to OM: production forecasting, sensitivity business opportunities and their feasibilities. The second part discusses the core functions of operations management such as cost of production and services, cost analysis, cost and price, product and service design. location choice (centralized and distributed production, facility layout, etc.. The third part concerns about operation analysis and tools used for decision-making and controlling the operations.

Outline:

Part one

- Introduction to Operations Management:
- IO model and transformation, resource dependency and inter and intra firms' dependency
- Competitiveness, Strategy, and Productivity
- IO model and transformation, resource dependency and inter and intra firms' dependency
- Forecasting and sensitivity.

Part two

- Product and Service Design.
- Cost of production and services'
- Cost estimation and cost controlling mechanisms
- Strategic Capacity Planning for Products and Services.
- Process Selection and Facility Layout.
- Work Design and Measurement.
- Location Planning and Analysis.
- Aggregate planning, queuing, waiting. bottleneck analysis
- Measuring and controlling the performance: KPI

Part three

- Key players (COO, CTO and executives) to develop, implement and execute operation/business plan
- Master Scheduling/inter and intra department coordination.
- Quality management and control : Standards (management, operation and products); ERP and MRP.

Decision making and controlling tools: MS Excel, Power Bi, Microsoft Dynamics 360 and etc,

Learning outcomes	On successful completion of this module, the students should be able: 1. Analyze complex questions in operations management, how to structure them, and to develop solution alternatives. 2. Apply fundamental operations management techniques for designing, planning, implementing and controlling a basic production: input acquisition, transformation process design and execution and output control problems and etc., 3. Identify and create cost effective supply chains for both inputs and outputs, and efficient inventory management. 4. Formulate and develop conceptual business/ operation plan 5. Recognize the tools used for operation management, controlling.
Literature	1. Bauer T, Erdogan B, Short J. Principles of Management Version. 4th edition. Boston Academic Publishing Inc; 2019. 2. Stevenson WJ. Operations Management. 12th edition. McGraw-Hill Education; 2014. 3. Rushton A, Croucher P, Baker P. The handbooks of logistics & distribution Management. 5th edition. United Kingdom: The Chartered Institute of Logistics and Transport; 2014.
Form of teaching	Lecture (2 UoI) Laboratory (2 UoI)
Assessment method	Written examination (90 min.) and academic performance
Associated study program	B.Sc. Industrial Engineering
Prerequisites for participation	Introduction to BA and EM, Introduction to Economics
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module, accounting for 30%, and the module examinations accounting for 70%

INDE304 – ENTREPRENEURSHIP

Module title	Entrepreneurship			**Module code**	INDE304
Duration	1 semester	**Semester**	Fall	**Module start**	5th
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. Ch. Enkhzaya			**Language**	English
Contents	This module allows students to integrate and apply entrepreneurship concepts and entrepreneurial thinking to project and business development. Entrepreneurship is not confined to the context of new ventures or start-ups only; it can occur within large and mature organizations (intrapreneurship) as well as within the non-profit sector. Thus, the module aims to help students develop the awareness and mind-set, attitude and competences to create and implement "the new". Students will work to develop a business plan in an experiential setting. Students will learn to forecast and analyse future financial needs, and find out how to secure funding for a new venture or to expand the existing business and how to present their business plan to venture capitalists. Outline: • Introduction to entrepreneurship. • The business idea and creativity methods • Innovation and intellectual property • Developing a business model, incl. industry and competitor analysis • Business plan basics and different types of business plans • Writing the Narrative, incl. vision, mission, value, overview, strategy, market analysis, marketing plan, operations • Financial plan basics • Assembling and presentation of a business plan The key concepts, methods and techniques will be introduced in lectures but students will be expected to work cooperatively in groups and work on both individual and team activities. The course will incorporate case studies and the analysis of real-world examples, and may include guest speakers.				
Learning outcomes	After having completed this course, students should be able to: 1. Recognize the nature and scope of issues involved in starting up new business projects. 2. Indicate the options available in terms of developing a new business/entrepreneurial organization in different contexts. 3. Apply creative methods to develop new (business) ideas. 4. Critically reflect on how to develop and utilize appropriate networks to access resources. 5. Indicate the importance of innovative technologies and demonstrate how they can form the basis of a sustainable business. 6. Apply numeracy skills to calculate the amount of start-up capital and time to break-even. 7. Mobilize their own skills and knowledge and to exploit a business opportunity. 8. Engage in various exercises such as brainstorming to develop organizational, communicational, team working and presentation skills. 9. Assess the validity of certain conclusions based on data and statistical analysis. 10. Design and present a business plan for funding and other purposes.				
Literature	1. Neck H, Neck C, Murray E. Entrepreneurship: The Practice and Mindset. 2nd Edition. Thousand Oaks: SAGA Publishing; 2020. 2. Barringer BR, Ireland RD. Entrepreneurship: Successfully launching new ventures. 8th edition. Pearson; 2018.				

	3. Masters B, Thiel P. Zero to One: Notes on Start-ups, or to build the Future. Crown currency; 2014. 4. Scarborough N. Effective Small Business Management an Entrepreneurial approach. McGraw-Hill; 2012. 5. Ries E. The Lean Start-Up. Crown currency; 2011.
Form of teaching	Lecture (1 UoI) Recitation (2 UoI) Field trip (1 UoI)
Assessment method	Written or oral examination (60 min.) and academic performance.
Associated study program	B.Sc. Industrial Engineering
Prerequisites for participation	Introduction to BA and EM, Introduction to Economics
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module, accounting for 70%, and the module examinations accounting for 30%.

INDE305 – FUNDAMENTALS OF MARKETING MANAGEMENT

Module title	Fundamentals of Marketing Management			**Module code**	INDE305
Duration	1 semester	**Semester**	Spring	**Module start**	6th
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Gerhard Wackenhut			**Language**	English
Contents	This module provides a contemporary view of the role and importance of marketing in the 21st century. Marketing describes a process that entails the planning, creation, integration and implementation of all diverse forms of communication that are delivered over time to a brand's targeted customers and prospects. The goal of marketing is ultimately to influence or directly affect the buying behavior of the targeted audience. Traditional, Digital, Social and Mobile marketing consider all touch points that a customer/prospect has with the brand. This module presents the fundamental marketing management within a market-oriented framework. Outline: • Marketing concepts and marketing management processes. • Understanding the company, consumers, and competitors in the marketplace. • Designing a marketing strategy using marketing instruments and tools, including brand management. • Contents marketing and conversion marketing. • Marketing in an international context.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Demonstrate the purpose and role of Marketing Management in the 21st century. 2. Critically reflect key issues of market-oriented management in organizations, especially with regard to pricing, product, place, and promotion (4P/7P). 3. Assess digital/online Marketing tools for Brand Management. 4. Apply specific techniques for strategic media planning and integrated Marketing campaigns. 5. Indicate what makes digital Marketing planning different from traditional media planning. 6. Design an elementary Marketing strategy, incl. Content Marketing. 7. Apply Marketing automation and Conversion Marketing. 8. Demonstrate an informed awareness how to get a high ROI from Marketing investments 9. Evaluate Marketing in an international context.				
Literature	1. Russel D. Social Media Marketing Guide 2021. Gain Customers Through Instagram, Facebook, Youtube, and Twitter. Independently published; 2020. 2. Godin S. This Is Marketing: You Can't Be Seen Until You Learn to See. Portfolio Penguin; 2018. 3. Breakenridge DK. Answers for Modern Communicators: A Guide to Effective Business Communication. 1st edition. Taylor & Francis; 2017. 4. Clow KE, Baack DE. Integrated Advertising, Promotion and Marketing Communications. 8th edition. Prentice Hall; 2017. 5. Young A. Brand Media Strategy: Integrated Communications Planning in the Digital Era. 1st edition. Palgrave Macmillan; 2016. 6. Kotler P, Armstrong G. Principles of Marketing. 16th ed. Prentice Hall; 2015. 7. Levinson JC, Levinson J. Guerrilla Marketing Remix: The Best of Guerrilla Marketing. 1st edition. McGraw-Hill; 2011. 8. Godin S. Permission Marketing:Turning Strangers Into Friends And Friends Into Customers. New edition. Simon & Schuster; 2007. 9. https://neilpatel.com/training/.				

Form of teaching	Lecture (2 UoI) Recitation (2 UoI)
Assessment method	Written examination (120 min) – based on a Marketing case study from the Engineering world; and academic performance (Report and Oral Presentation)
Associated study program	B.Sc. Industrial Engineering
Prerequisites for participation	Introduction to BA and EM, Introduction to Economics
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module, accounting for 30%, and the module examinations accounting for 70%

INDE306 – SUPPLY CHAIN MANAGEMENT

Module title	Supply Chain Management			**Module code**	INDE306
Duration	1 semester	**Semester**	Spring	**Module start**	6th
Credit points	6 CP	**Workload**	180 h	**Contact hours**	48 h
				Individual study	132 h
Module coordination	Dr. S. Otgonbayar			**Language**	English
Contents	In this course, students will view the supply chain from the perspective of a general manager. Logistics and supply chain management concerns managing the hand-offs in a supply chain - hand-offs of either information or products. The design of a logistics system is critically linked to the objectives of the supply chain. Our goal in this course is to understand how logistical decisions impact the performance of the company as well as the entire supply chain. The key will be to understand the link between supply chain structures and logistical capabilities in a company or a supply chain. Outline: • Fundamentals: Chapter 1: Introduction to Supply Chain Management. Chapter 2: Logistics Fundamentals. • Supply Chain Design and Planning: Chapter 3: Logistics Essentials to Strategy. Chapter 4: Supply Chain Efficiency. Chapter 5: Supply Chain Responsiveness. • Supply Chain Operations: Chapter 6: Inventory Management. Chapter 7: Warehouse Operations.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Analyze complex questions in operations management, to structure them and to develop alternative solutions. 2. Apply fundamental operations management techniques to strategic, tactical and operational problems. 3. Design and control a basic production process.				
Literature	1. Chopra S, Meindl P. Supply Chain Management. 3rd edition. Pearson Prentice Hall. New York; 2015. 2. Cachon G, Terwiesch C. Matching Supply with Demand. Boston:McGraw-Hill; 2012.				
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)				
Assessment method	Written examination (60 min.) and academic performance (including lab report)				
Associated study program	B.Sc. Industrial Engineering				
Prerequisites for participation	Introduction to BA and EM, Introduction to Economics				
Requirements for receiving credit points	Passing the module				
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.				

INDE307 – BUSINESS INFORMATION SYSTEMS

Module title	Business Information Systems			**Module code**	INDE307
Duration	1 semester	**Semester**	Fall	**Module start**	6th
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	TBD			**Language**	English
Contents	In this module, students receive a general view of the integration of business and technology. It provides comprehensive and integrative coverage of the essential new technologies, information system applications, and their impact on business models and managerial decision-making. From a managerial perspective, the module addresses concepts regarding hardware, software, services, and data organization. The students will learn the basics of Cross-Functional Enterprise Applications and Functional Business Systems with a focus on economic issues as well as the significance of information systems for companies, and the practical information and communication technologies for increasing the efficiency and effectiveness of information systems. Outline: • Introduction: the domain of business information systems. • Application software and Systems software • Organizations and systems. • Data, information, and knowledge. • Information systems and organizational infrastructure. • Communication infrastructure. • ICT systems infrastructure in Enterprise Resource Planning (ERP), Customer Relationship Management (CRM) and Supply Chain Management (SCM). • Electronic business, electronic commerce, and electronic government. • Assessing the use and impact of information systems. • Planning and Implementation. • Services, projects, and operations. • Information systems development. • Cyber Security (Firewalls, VPN, SSO, Insider Threat).				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Analyze complex questions in IT operations management, to structure them and to develop alternative solutions. 2. Apply fundamental operations management techniques to strategic, tactical and operational business/IT problems. 3. Demonstrate a deeper understanding of ERP, CRM and SCM. 4. Apply the requirements of professional eCommerce Systems. 5. Master the Systems Development Life Cycle, incl. Feasibility, Functional Requirements, System Specifications, Implementation / Deployment, Evaluating Hardware, Software & Services, Data Conversion, and System Maintenance.				
Literature	1. Laudon K, Laudon J. Management Information Systems: Managing the digital firm. 14th edition. Pearson Education:Prentice Hall; 2019. 2. Behl R, O'Brien JS, Marakas GM. Management Information Systems. McGraw-Hill; 2018.				
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)				
Assessment method	Written examination (120 min) – based on a BIS case study from the Engineering world; and academic performance (Report and Oral Presentation)				

Associated study program	B.Sc. Industrial Engineering
Prerequisites for participation	Introduction to BA and EM, Introduction to Economics, Algorithms and Programming
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.

INDE308 – FINANCE FOR ENGINEERS I

<table>
<tr><td>Module title</td><td colspan="3">Finance for Engineers I</td><td>Module code</td><td>INDE308</td></tr>
<tr><td>Duration</td><td>1 semester</td><td>Semester</td><td>Spring</td><td>Module start</td><td>6th</td></tr>
<tr><td rowspan="2">Credit points</td><td rowspan="2">4 CP</td><td rowspan="2">Workload</td><td rowspan="2">120 h</td><td>Contact hours</td><td>48 h</td></tr>
<tr><td>Individual study</td><td>72 h</td></tr>
<tr><td>Module coordinator</td><td colspan="3">G. Dorjsundui</td><td>Language</td><td>English</td></tr>
<tr><td>Syllabus</td><td colspan="5">Any entrepreneurial action addresses which projects to accept and how to finance them. The course focuses on the basic theory and practice of investment analysis on real assets to answer decision-making of foremost financial options. This starts with basic evaluation techniques (in particular net present values, internal rates of return), leads to extensions (e.g. after-tax calculations), payout policies and finally to concepts of portfolio selection. The course will cover financial topics as shown in the outline:

Outline:

Fundamentals of Investments & Finance

• Financial Statement and Report
• Cash Flow and Balance sheet
• Time Value of Money
• Tax
Basic Investment Analysis Under Certainty

• Traditional / Static Approaches / Financial Ratios
• Net Present Value
• Internal Rates of Return
• Dynamic Payback Period
Extended Investment Analysis Under Certainty

• Interest Rate Structures
• Yield curve
• Financial Contracts
• Tax inclusion

Basic Investment Analysis Under Uncertainty
Basic Portfolio theory and Capital Asset Pricing Model.</td></tr>
<tr><td>Learning outcomes</td><td colspan="5">On successful completion of this module, the students should be able to:

1. Apply basic concepts of investment and financing analysis.
2. Understand pitfalls in various methods of obtaining net present value.
3. Extend the basic investment evaluation techniques.
4. Analyze how financing and taxes affect capital allocation decisions.
5. Perform and assess a portfolio selection with tracking the real asset cash flows.</td></tr>
<tr><td>Literature</td><td colspan="5">1. Brealey AR, Myers CS, Allen F. Principles of corporate finance. 13th edition. McGraw-Hill; 2019.
2. Brigham FE, Ehrhardt CM. Financial management – theory and practice. 16th edition. Nelson Education Ltd; 2019.
3. Colbe BV, Witte F. Investitionstheorie und Investitionsrechnung. 5th edition. Berlin:Springer; 2018.
4. Besley S, Brigham EF. Principles of finance. 6th edition. McGraw Hill; 2015.
5. Van Horne CJ, Wachowicz MJ. Fundamentals of financial management. 13th edition. Prentice Hall; 2009.</td></tr>
</table>

Form of teaching	Lecture (2 UoI) Recitation (2 UoI)
Assessment method	Written examination (90 min.) and academic performance.
Associated study program	B.Sc. Industrial Engineering
Prerequisites for participation	Introduction to BA and EM, Introduction to Economics, Introduction to Accounting
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.

INTR301 – INDUSTRIAL INTERNSHIP + REFLECTION

Module title	Industrial Internship + Reflection			**Module code**	INTR301
Duration	1 semester	**Semester**	Spring	**Module start**	6th
Credit points	10 CP	**Workload**	10 weeks internship + 24 h	**Contact hours**	
				Individual study	300 h
Module coordinator	Prof. Ch.Enkhzaya			**Language**	English
Contents	TBD prior to internship. The Industrial Internship experience provides students with opportunities to explore career interests while applying knowledge and skills learned in the classroom in a work setting. Internship experience also helps students gain a clearer sense of what they still need to learn and provides an opportunity to create professional networks.				
Learning outcomes	After taking part in the industrial placement, the student should be able to: 1. Explain the social side of the work process based on secondary socializing in the business, and describe the business as a social structure. 2. Assess his or her future position and prospects in the business. 3. Provide a written statement of the activities carried out, and appropriately record their observations and experiences. 4. Assess the specialization that he/she will choose for his/her career based on the studies to date, and the overall appreciation that has been gained by exposure to the practical, and in-depth experience of their theoretical knowledge. 5. Describe and evaluate the complex interrelationships between the areas preceding and following the production area. 6. Produce a written record of complex technical relationships and production processes.				
Literature	None				
Form of teaching	Industrial internship (10 weeks)				
Assessment method	Written report (min. 10 p.) and oral presentation (20 min.)				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering				
Prerequisites for participation	Completion of Basic Internship				
Requirements for receiving credit points	Confirmation of participation in the internship, Acceptance of the written report, participation in the seminar				
Grading system	Pass / Fail				

INDE401 – FINANCE FOR ENGINEERS II

Module title	Finance for Engineers			**Module code**	INDE401
Duration	1 semester	**Semester**	Fall	**Module start**	7th
Credit points	6 CP	**Workload**	180 h	**Contact hours**	48 h
				Individual study	132 h
Modul coordinator	Dr. S. Otgonbayar			**Language**	English

Contents

The course covers the principles of corporate finance with special focus on investment decision engineers at all levels within the company who make a capital proposal are contributing to the strategic success of the company. Thus, the class aims to provide students with a working knowledge of the financial evaluation and the funding of capital projects.

The following topics concerning capital investment are discussed: the context of financial and investment decisions, the assessment of their returns, the assessment of their risks, and their funding opportunities, financing.

Outline:

An Overview
- The Engineer's Role in Business: capital-expenditure decisions
- Impact of engineering projects on financial statements
- Types of strategic engineering financial and economic decisions
- Investment decision and financing decision
- Assessment of the risk
- Decision Authority: Small and large engineering decisions

Financial analysis:
- Pre-feasibility study of the Engineering design and mining
- Historical financial data and projection scenarios
- Investment options:
- Capital Cost: End Use and Level of accuracy

Evaluation of capital projects
- Practical Issues in the Evaluation of Projects
- Sensitivity and Scenario Analysis

Risk in Engineering Projects
- Certainty and Uncertainty: business, financing and investment risk
- Sources of Uncertainty: Company-level, Project-level Risks

Sources of Finance
- Lenders, Borrowers and Financial Institutions
- Financial Securities: Equity, Debt, Types of Loans, PPP
- Comparison of Equity and Debt Financing

Real Options Analysis
- Financial Options
- Options on Non-financial Assets: Real Options
- The Valuation of Options: Risk-free Portfolio, Risk-neutral Probability
- Valuation of Real Options
- Decision-making Process

Learning outcomes

On successful completion of this module, the students should be able to:

1. Critically reflect key issues of corporate financial analysis as a core part of business management in organizations.
2. Understand and able to use financial statement for their analysis
3. Categorize equity and debt financing.
4. Apply the fundamentals of corporate finance at work and be able to work within team of business management.

Literature	1. Atrill P. Financial, Management for decision makers. 9th edition. Pearson; 2019. 2. Crundwell FK. Finance for Engineers: Evaluation and Funding of Capital Projects. 1st edition. Springer; 2008.
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)
Assessment method	Written examination (90 min.) and academic performance
Associated study program	B.Sc. Industrial Engineering
Prerequisites for participation	Introduction to BA and EM, Introduction to Economics, Introduction to Accounting, Finance for Engineers I
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module, accounting for 30%, and the module examinations accounting for 70%

INDE402 – OPERATIONS RESEARCH

Module title	Operations Research			**Module code**	INDE402
Duration	1 semester	**Semester**	Fall	**Module start**	7th
Credit points	6 CP	**Workload**	180 h	**Contact hours**	48 h
				Individual study	132 h
Module coordinator	G. Dorjsundui			**Language**	English

Contents

The course aims at transferring the basic knowledge of operations research: building capabilities in the students for analyzing different situations in the industrial/ business scenario involving limited resources and finding the optimal solution within constraints.

The goal of and scope of industrial engineer's work become much broader concerning productivity and all of the technical problems of production cycle management and control. They are in charge of various branches of companies: manufacturing, distribution, transportation, mercantile, and service being responsible to integrate the physical, financial, economic, and human components of a company to attain the set goals.

Henceforth, the implicit objectives in this course is to introduce concepts and techniques related to the design, planning, control, and improvement of both manufacturing and service operations based on the data-driven methodologies.

In this course, the first part deals with problem statements and knowledge of challenges as data collection and analysis. Furthermore, in the next part, expanding to the specific models in order to have decision-making options.

- Operations research base: data and performance measurement
- Data analysis and data engineering
- Modeling and applying various data analytical tools
- Data presentation and using for operational, financial and engineering decision making
- Applications and models in Operation research with emphasis on optimality and stability of process and system.

1. An Overview: data, data analysis, data engineering; data and big data: types, characteristics, presentation and examples, analyze any real-life system with limited constraints: transform; the problem into a mathematical model, solve the mathematical model manually as well as using various software and applications.

2. Data analysis and interpretation: variable (dependent, independent and control variables), trend analysis and data cleaning, time series, cross section, and panel data

3. Data presentation and visualization: metrics and measuring the performance, dynamic and static data, tools

4. Modeling

   - Linear programming models: Aggregate plan; working schedule; linear production process
   - Network models: Transportation; Assignment and Logistic systems
   - Integer Programming models: Capital budgeting; Fixed-cost model; location-assignment problem; ordering problem
   - Non-linear models: Extension of location problem; Portfolio optimization
   - Queueing Models: Analytic Steady-State and simulative model
   - Regression and Forecast models
   - Valuation of Real Options
   - Decision-making Process

Learning outcomes	On successful completion of this module, the students should be able to: 1. Analyze data needed for investment, engineering, operations decision making. 2. Use data analysis and visualization tools such as: Python, R, Power BI and etc., 3. Construct problem-based models of manufacturing and service processes. 4. Identify and determine the model parameters from the possible resources. 5. Distinguish between different modeling approaches based on the problem statement, and solving the models with specifications. 6. Assess the model solution for decision making process and implementation.
Literature	1. Winston LW, Albright CS. Practical Management Science. 6th edition, Cengage Press; 2019. 2. Carter WM, Price CC. Operation Research: A practical introduction. 2nd edition. CRC Press; 2019. 3. Taha AH. Operations Research: Introduction. 10th edition. Pearson; 2016. 4. Anupindi R. Managing Business Process Flows. 3rd edition. Pearson; 2014.
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)
Assessment method	Project and academic performance
Associated study program	B.Sc. Industrial Engineering
Prerequisites for participation	Introduction to EM and BA, Introduction to Economics, Introduction to Statistics, Supply Chain Management
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module, accounting for 30%, and the module examinations accounting for 70%.

INDE403 – INTRODUCTION TO ORGANIZATIONAL BEHAVIOR

Module title	Introduction to Organizational Behavior			**Module code**	INDE403
Duration	1 semester	**Semester**	Spring	**Module start**	7th
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	84 h
Module coordinator	Prof. Ch. Enkhzaya			**Language**	English
Contents	Organizational Behavior has become one of the most powerful tools for both public and private organizations to improve internal operations, to respond rapidly to external opportunities, to achieve technological breakthroughs, to streamline new product development and to more robustly manage the challenges arising from the business environment. The module provides students with an introduction to the human dimensions of work organizations and encourages them to think critically and creatively about the ways in which people shape organizations and are, in turn, shaped by organizations. That is why many leading technology universities integrate this module to engineers as part of their undergraduate degrees in their management training. Outline: • The nature of Organizational Behavior: Work, Employment & Current Trends • Perception and Identity • Motivation and Control • Interpersonal Interaction and Team Dynamics • Ethical Decision Making and Conflict Resolution • Structure and New Organizational Forms • Politics and Stakeholder Analysis • Leadership • Culture and Cultural Change • Technology and Organizational Behavior • Organizational Change • Summary				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Recall the nature and specifics of an organizational behavior as discipline 2. Integrate key themes in organizational behavior in order to develop a more sophisticated critical understanding of organizations in a complex, ambiguous, diverse and changing environment 3. Recognize and appreciate the challenges and practical aspects of organizing and managing in organizations 4. Reflect upon their own assumptions with regard to organizational behavior and management 5. Analyze organizational situations using relevant theory 6. Apply related techniques for organizational problems.				
Literature	1. Robbins S, Judge T. Essentials of Organizational Behavior. 14th Edition. Pearson; 2017. 2. Grant A, Sandberg S. Originals: How Non-Conformists Move the World. Penguin Books; 2017. 3. Kitchin D. An Introduction to Organizational Behavior for Managers and Engineers: A Group and Multicultural Approach, Butterworth-Heinemann; 2010.				
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)				
Assessment method	Written examinations (90 min.) and academic performance				

Associated study program	B.Sc. Industrial Engineering
Prerequisites for participation	Introduction to BA and EM, Introduction to Economics, optimally Project Management, optimally Operations Management
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module, accounting for 30%, and the module examinations accounting for 70%

STWR401 – SCIENTIFIC WRITING

Module title	Scientific Writing			**Module code**	STWR401
Duration	1 semester	**Semester**	Fall	**Module start**	7th
Credit points	4 CP	**Workload**	120 h	**Contact hours**	24 h
				Individual study	96 h
Module coordinator	Prof. G. Gantuya			**Language**	English
Contents	This module instructs the basics required for the scientific writing and publishing of project works and bachelor theses, and for producing reasonable presentations for conferences, seminars, etc.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Utilize the principles of scientific writing. 2. Competently recapitulate issues. 3. Carry out literature researches. 4. Grasp didactically prepared mediation. 5. Give and assess verbal presentations. 6. Apply moderation techniques.				
Literature	None				
Form of teaching	Recitation (2 UoI)				
Assessment method	Homework, Project work, Presentations				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	None				
Requirements for receiving credit points	Passing the module				
Grading system	Pass / Fail				

INDE404 – NATURAL RESOURCE GOVERNANCE

Module title	Natural Resource Governance			**Module code**	INDE404
Duration	1 semester	**Semester**	Spring	**Module start**	8th
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. Ch. Enkhzaya			**Language**	English

Contents

The experience of resource-rich countries shows that good natural resource governance – effective institutions including their enforcement mechanism – was the key to success. The main dimensions of resource governance are: getting a good deal from a mining project (how is the resource extraction embedded into the local economy?), efficiently managing resource revenues (what is the share of government income from the mining project and how is it distributed/invested?), effectively addressing environmental and social impacts of extraction (how is the environment and the community affected by the mining project?).

The module provides students with an introduction to the natural resource governance as a chain of decisions. It aims to equip students with the understanding of key concepts, with the skills/tools to analyze policy debates and evaluate governance processes. The perspective of energy transition is also considered. The role that different stakeholders such as government, civil society, business and academia actors can play in supporting this process is also addressed

Outline:

Why: natural resource governance and resource-driven development
What and how: the decision chain:
- Discovery and extraction
- Getting a good deal
- Managing revenues

National and international foundations for resource governance
Natural resource governance and energy transition
Experience of different resource rich countries incl. Mongolia
Summary

Learning outcomes

On successful completion of this module, the students should be able to:

1. Recall the concepts and principles of good natural resource governance as well as different real cases,
2. Describe the risks involved in ignoring the importance of good natural resource governance.
3. Identify policies, practices and experiences concerning licensing, fiscal regimes, revenue management and sustainability
4. Outline the nature and dynamics of the stakeholders' cooperation, and the role of state.
5. Recognize the range of challenges such as resource curse, corruption, quality of community participation etc.
6. Recognize the requirements of maintaining a good natural resource governance for sustainable development
7. Analyze the significance of both national/ international policies and debates.

Literature

1. Dietsche E. Political Economy and Governance. WIDER Working Paper; 2017.
2. Collier P. The Political Economy of Natural Resources. Social Research; 2010.
3. Collier P, Goederis B. Commodity Prices, Growth, and the Natural Resource Curse: Reconciling a Conundrum. University of Oxford; 2007.
4. Natural Resource Charter (ENG) https://resourcegovernance.org/publications/natural-resource-charter-2nd-ed
5. Natural Resource Charter (MNG)
6. https://resourcegovernance.org/node/5875

Form of teaching

Lectures (2 UoI)

	Recitation (2 UoI)
Assessment method	Course work in the form of an essay (2000-3000 words) and academic performance.
Associated study program	B.Sc. Industrial Engineering
Prerequisites for participation	Engineer in Society, Introduction to Economics, Introduction to Business Administration and Engineering Management, Introduction to Mining
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination (essay) accounting for 70%

INDE405 – QUALITY MANAGEMENT

Module title	Quality Management			**Module code**	INDE405
Duration	1 semester	**Semester**	Fall	**Module start**	8th
Credit points	6 CP	**Workload**	180 h	**Contact hours**	48 h
				Individual study	132 h
Module coordinator	Prof. Ch. Enkhzaya			**Language**	English
Contents	In this course, students learn different methods of quality management and how important quality management is for organizations. Increasing the satisfaction of customers and other stakeholders through effective goal deployment, cost reduction, process improvement, people involvement, and supply chain development has proved essential for organizations to stay in existence in the twenty-first century. We cannot avoid how quality has developed into one of the most important, competitive weapons, and many organizations have realized that TQM, and its relatives, is the way of managing for the future. During the semester, we will consider topics such as: • Understanding Quality. • Models and frameworks for Total Quality Management. • Leadership and commitment. • Policy, strategy and goal deployment. • Partnerships and resources. • Design for quality. • Performance measurement frameworks. • Self-assessment, audits and reviews. • Benchmarking and change management. • Process management. • Process redesign/engineering. • Quality management systems. • Continuous improvement – the basics. • Continuous improvement – more advanced, including Taguchi and Six Sigma. • Continuous improvement – Lean systems. • Human resources management. • Culture changes through teamwork. • Communications, innovation and learning. • Implementing TQM.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Relate quality and quality management to operations management 2. Structure operations and integrate quality perspective (customer needs) 3. Analyze complex questions in quality management 4. Develop alternative solutions 5. Apply fundamental quality management techniques to strategic, tactical and operational problems. 6. Design and control a basic production process.				
Literature	1. Oakland JS. Total Quality Management and Operational Excellence. New York: Taylor & Francis Ltd; 2014. 2. Panneerselvam R. Quality Management. Prentice-Hall of India; 2014.				
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)				
Assessment method	Written examination (90 min.) and academic performance				
Associated study program	B.Sc. Industrial Engineering				

Prerequisites for participation	Introduction to BA, and EM, Introduction to Economics, Operations Management, Project Management
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module, accounting for 30%, and the module examination accounting for 70%

PROJ401 – FINAL STUDY PROJECT

Module title	Final Study Project			**Module code**	PROJ401
Duration	1 semester	**Semester**	Spring	**Module start**	8th
Credit points	6 CP	**Workload**	180 h	**Contact hours**	54 h
				Individual study	126 h
Module coordinator	Prof. M.Hampe			**Language**	English
Contents	Students from different engineering disciplines will work as a team on a current research topic. Through the module students will learn and practice: Soft skills to cooperate. Brainstorming to find a solution. Formulate engineering problems. Problem solving procedures. Application of engineering knowledge for solution. Computation of initial and life cycle cost of system.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Solve a design task with the help of systems engineering. 2. Recognize and specify complex problems occurring in industrial practice. 3. Ascertain and evaluate variants within a team solution. 4. Carry out the main features of an exact time and work schedule team, repeatedly, if necessary. 5. Perform different roles in a team. 6. Represent and assess divergent positions, and develop a problem solution.				
Literature	The literature for this module depends on the project and will be provided be the program coordinators.				
Form of teaching	Project course (3-weeks interdisciplinary project work, and 1-day field trip), supervised by lecturers of all disciplines involved.				
Assessment method	Written report and oral presentation				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	None				
Requirements for receiving credit points	Passing the module				
Grading system	The final grade is based on the written report (70%), and based on the academic performance /oral presentations (30%)				

THES401 – BACHELOR THESIS + COLLOQUIUM

Module title	**Bachelor Thesis + Colloquium**			**Module code**	THES401
Duration	1 semester	**Semester**	Spring	**Module start**	8th
Credit points	12 CP	**Workload**	360 h	**Contact hours**	
				Individual study	360 h
Module coordinator	Supervisors			**Language**	English
Contents	Current research topics from the general research area in the area of the administering institute.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Solve scientific questions in a structured manner using engineering science methods. 2. Critically differentiate between various solutions. 3. Present their results in written and oral form in a scientifically acceptable manner.				
Literature	Depends on the topic.				
Form of teaching	Thesis supervision.				
Assessment method	Written thesis (14 weeks handover deadline) and a colloquium (20 min. presentation followed by discussion)				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	Possible prerequisites will be prescribed by the individual institute supervising the thesis. At least 171 credit points must have been earned.				
Requirements for receiving credit points	Passing the thesis and the presentation				
Grading system	The final grade for the Bachelor thesis consists of the grade of the thesis and of the grade of the performance in the colloquium with a weighting of 4:1 provided that the thesis grade was rated at least as “passed”.				

BUSINESS ELECTIVE MODULES

INDE406 – MANAGERIAL ACCOUNTING

Module title	Managerial Accounting			**Module code**	INDE406
Duration	1 semester	**Semester**	Spring	**Module start**	7th
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	TBD			**Language**	English
Syllabus	Accounting consistently integrates the most current practice and theory. This course emphasizes the basic theme of "different costs for different purposes" and reaches beyond cost accounting procedures to consider concepts, analyses, and management. Outline: • The Manager and Management Accounting • An Introduction to Cost Terms and Purposes • Cost - Volume - Profit Analysis • Job Costing • Activity-Based Costing and Activity-Based Management • Master Budget and Responsibility Accounting • Flexible Budgets, Direct-Cost Variances, and Management Control • Flexible Budgets, Overhead Cost, and Management Control • Inventory Costing and Capacity Analysis • Determining How Costs Behave • Decision Making and Relevant Information • Strategy, Balanced Scorecard, and Strategic Profitability Analysis • Pricing Decisions and Cost Management • Cost Allocation, Customer-Profitability Analysis • Allocation of Common Costs, and Revenues • Cost Allocation: Joint Products and By-products • Process Costing • Income statement • Balance sheet • International Finance reporting standards.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Apply different methods of cost accounting 2. Provide the management with guidance for operational and strategic decisions 3. Design a basic costing system 4. Suggest pricing decisions 5. Assess income statements and balance sheets.				
Literature	1. Drury C. Management and Cost Accounting. 9th edition. Cengage Learning EMEA; 2015 2. Horngren CT, Datar SM, Rajan MV. Cost Accounting. 15th edition. Prentice Hall; 2014.				
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)				
Assessment method	Written examination (90 min.) and academic performance				

Associated study program	B.Sc. Industrial Engineering
Prerequisites for participation	Introduction to Economics, Introduction to BA and EM, Introduction to Accounting, Finance for Engineers I, Finance for Engineers II
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.

INDE407 – SOCIAL PERFORMANCE IN (MINING) OPERATIONS

Module title	Social Performance in (Mining) Operations			**Module code**	INDE407
Duration	1 semester	**Semester**	Spring	**Module start**	5th and 7th
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. Ch. Enkhzaya			**Language**	English

Contents

There can be no doubt as to the historic role that mineral exploitation has played in the advancement of societies, and in more recent times in the economic growth and industrialization of the countries. At the level of individual mining projects, however, this acceptance is neither automatic nor unconditional, and since 1990 has become increasingly tenuous. And once seen as a corporate 'nice-to-have,' Social License is now a critical part of industry operations in mining, forestry, agriculture and beyond – and actions that damage society's trust and respect in a company can have serious bottom-line consequences. In Mongolia, international mining investors see acceptance by local communities as one of the two major challenges.

The module provides students with an introduction to the concept of social performance in mining and to the social acceptance of mining throughout the entire mine life cycle – from prospecting and exploration going to mining, processing, rehabilitation and mine closure. It aims to equip students with the understanding and the skills/tools to deliver social performance and to build and maintain Social License to Operate (SLO). With a particular emphasis on sustainability and equitable development students will learn how to undertake stakeholder consultation as input into organizational decision making.

Outline:

What is Social Performance as concept and practice area?

- Foundations: the changing global context, key concepts, application of management systems for social performance
- Understanding social impact
- Social performance function

What is SLO and why is it important?

- Definition and historical development
- Sustainability: equitable development
- Social capital and social license to operate

Social License to Operate

- stakeholder analysis,
- engagement and communication processes,
- grievance management,
- input of stakeholder views into decision making,
- ethical aspects

Experience of different countries incl. Mongolia

Learning outcomes

On successful completion of this module, the students should be able to:

1. Explain social performance in the context of mining and sustainable development
2. Link social performance and community engagement into broader business
3. Analyze the social performance of organizations
4. Apply management systems for social performance domain
5. Identify the concept, principles and business case for a social license to operate in mining,
6. Explain the risks involved in ignoring the importance of a social license.
7. Describe the nature and dynamics of the stakeholder network and the role of social capital,
8. Determine how to interact with communities to establish a legitimate social license to operate.
9. Recognize the requirements of maintaining a durable social license to operate.

	10. Apply the above to conduct basic analysis of real-life cases.
Literature	1. Meesters ME, Behagela JH. The Social License to Operate: Ambiguities and the neutralization of harm in Mongolia, Resources Policy, Volume 53. 2017. 2. Black L. The Social Licence to Operate: Your Management Framework for Complex Times. 1st edition. DoShorts; 2013. 3. International Council of Mining and Metals: Community Development Toolkit; 2012. www.icmm.com 4. Boutilier RG. Modeling and measuring the social license to operate: fruits of dialogue between theory and practice. 2011. 5. Social Performance in Mining 6. https://socialicense.com
Form of teaching	Lecture (1 UoI) Recitation (2 UoI) Field trip (1 UoI)
Assessment method	Written examination (90 min.) and academic performance
Associated study program	B.Sc. Industrial Engineering
Prerequisites for participation	Engineer in Society, Introduction to Mining, Introduction to Economics, Introduction to BA and EM.
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.

INDE408 – MINE WATER MANAGEMENT

Module title	Mine Water Management			**Module code**	INDE 408
Duration	1 semester	**Semester**	Fall	**Module start**	5th and 7th
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72
Module coordinator	Dr. P. Bolormaa			**Language**	English
Contents	This course explores the principles and practices of mine water management, covering water resources management (IWRM), water sources, water balance, the environmental, technical, and regulatory aspects. Students will gain a comprehensive understanding of IWRM, water's role in mining operations, the challenges of managing mine water, and sustainable practices to mitigate environmental impacts. The content of module will include: • Introduction to Mine Water Management • IWRM paradigm and its practical application • Water sources in mining operations • Water balance in Mining • Environmental aspects of mine water management • Introduction to technical aspects of mine water management • Regulatory framework and compliance • Sustainable Practices in Mine Water Management.				
Learning Outcomes	On completion of this course, students will be equipped with knowledge, skills, and competencies needed to manage mine water resources responsibly and sustainably in the mining industry. These include: 1. Explain the role of mine water management in mining operations 2. Describe the Integrated Water Resources Management (IWRM) principles and their application in the context of mining operations 3. Identify various sources of water in mining operations and determine how to manage water balance effectively to ensure sustainable water use 4. Recognize sustainable practices for mitigating environmental impacts associated with mine water management, with a focus on water reuse, recycling, and ecosystem-based approaches 5. Analyze environmental challenges associated with mine water management, including issues such as acid mine drainage, heavy metal contamination, and impacts on aquatic ecosystems 6. Apply regulatory frameworks governing mine water management.				
Literature	1. ICMM. Water Stewardship Maturity Framework. ICMM; 2023 2. Punkkinen H, Räsänen L, Mroueh UM, Korkealaakso J, Luoma S, Kaipainen T, Backnäs S, Turunen K, Hentinen K, Pasanen A, Kauppi S, Vehviläinen B, Krogerus K. Guidelines to mine water management. Finnish Environment Institute & Geological Survey of Finland; 2016. 3. Grigg NS. Integrated Water Resources Management. 1st edition. Palgrave Macmillan; 2016.				
Form of teaching	Lecture (1 UoI) Recitation (2 UoI) Field trip (1 UoI)				
Assessment method	Mid-term test, assignment, student led discussion, written examination (60 min.)				

Associated study program	B.Sc. Industrial Engineering
Prerequisites for participation	Introduction to Mining, Mining and Environment, Introduction to Economics, Introduction to BA and EM
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the mid term test (15%), group assignment (20%), student led discussion (25%), and final exam 40%.

ENGINEERING ELECTIVE MODULES

ENSS150 – ENGINEERING SUMMER SCHOOL

Module title	Engineering Summer School			**Module code**	ENSS150
Duration	2 weeks	**Semester**	Fall or Spring	**Module start**	2nd
Credit points	3 CP	**Workload**	90 h	**Contact hours**	60 h
				Individual study	30 h
Module coordinator	Dr. T. Narangarav			**Language**	English
Contents	Interdisciplinary summer school with reference to GMIT's profile consisting of lab work, excursions, field trips and lectures. The following topics will be covered: • Engineering, especially in the context of the resource industry • Environmental aspects of industrial activities • Mining & industry in Germany • Geology • Intercultural competence & self-organization • Higher education institutions and student life abroad The Summer school is accompanied by social events that enforce intercultural contacts.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Explain the general function of industrial or scientific processes covered and the interaction of different processes with another. 2. Identify different materials and their properties and explain their uses in the industrial processes observed. 3. Explain the difference between open pit and underground mining and of the difference technology in use. 4. Describe impacts on the environment and health along the added value chain of natural resources. 5. Perform different activities which are part of mining engineering, such as loading, drilling etc. 6. Identify minerals and rocks and explain their properties 7. Identify different periods in German history, to compare with Mongolian history and to evaluate the impact of historical developments on the present 8. Apply presentation skills				
Literature	None				
Form of teaching	Lab work, excursion, field trip, lectures				
Assessment method	Report, presentation on major program points				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				

Prerequisites for participation	Open to 1st year students, in exceptional cases, students of other semesters are eligible, selection criteria, e.g. academic performance, motivation, personal qualification
Requirements for receiving credit points	Attendance of all parts of the program and successful completion of module
Grading system	Pass / Fail. Final report and presentation accounting for 50% each.

ENSS151 – ENGINEERING SUMMER SCHOOL

Module title	Engineering Summer School			**Module code**	ENSS151
Duration	4 weeks	**Semester**	Fall or Spring	**Module start**	4th
Credit points	3 CP	**Workload**	90 h	**Contact hours**	60 h
				Individual study	30 h
Module coordinator	German Professors (TDB)			**Language**	English
Contents	Interdisciplinary summer school consisting of lectures, recitations, lab works, excursions and intercultural activities. The following topics will be covered: • Introduction to mining safety engineering • Mining & industry in China • Geology • Culture and language • Modern coal mining technology The Summer school is accompanied by social events that enforce intercultural contacts.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Recognize the work process in the mining area and its social and technical aspect. 2. Assess career prospects in the business. 3. Explain the general function of industrial or scientific processes covered and the interaction of different processes with another. 4. Identify different materials and their properties and explain their uses in the industrial processes observed. 5. Explain underground mining and of the difference technology in use. 6. Describe impacts on the environment and health along the added value chain of natural resources. 7. Identify different periods in Chinese history, to compare with Mongolian history and to evaluate the impact of historical developments on the present. 8. Apply skills in writing of reports and essays.				
Literature	None				
Form of teaching	Lab work, excursion, field trip, lectures				
Assessment method	Report, presentation on major program points				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	Open to 2nd year students, in exceptional cases, students of other semesters are eligible, selection criteria, e.g. academic performance, motivation, personal qualification.				
Requirements for receiving credit points	Attendance of all parts of the program and successful completion of module				
Grading system	Pass / Fail. Certificate of the course				

RMPE302 – MINERAL PROCESS ENGINEERING I

Module `title	Mineral Process Engineering I + Process Mineralogy			**Module code**	RMPE302
Duration	1 semester	**Semester**	Fall	**Module start**	5
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	B. Myagmarjav			**Language**	English
Contents	• Definition and importance of mechanical separation in mineral processing, physical properties of minerals for separation, particle characterization, and particle liberation. • Basic operations in procedural technique: comminution and size separation technologies, basic principles of size classification, principles of crushing technology, devices for classification and comminution. • Principles of sedimentation and solid-liquid separation. • Importance of ore sampling procedure. • Process selection and flowsheet design in mineral processing.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Describe and explain the importance of mechanical separation, physical properties of minerals, and their effects for separation. 2. Design base enrichment flow sheets. 3. Evaluate mechanical separation results. 4. Determine particle liberation. 5. Evaluate the performance of comminution and classification equipment. 6. Enrichment by size classification.				
Literature	1. AT Mineral Processing Journal. 2. Wills BA. Mineral Processing Technology. 4th edition. Oxford:Pergamon Pres; 1988. 3. Weiss NL. SME Mineral Processing Handbook. New York: Society of Mining Engineers; 1985.				
Form of teaching	Lecture (2 UoI) Recitation (1 UoI) Laboratory (1 UoI)				
Assessment method	Written examination (90 min.) and academic performance.				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering				
Prerequisites for participation	Completion of semester 1-4				
Requirements for receiving credit points	Passing the module				
Grading system	The final grade consists of the academic performance during the module accounting for 60% and the module examination accounting for 40%.				

RMPE307 – MINING AND ENVIRONMENT

Module title	Mining and Environment			**Module code**	RMPE307
Duration	1 semester	**Semester**	Spring	**Module start**	6
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. T. Hollenberg			**Language**	English
Contents	The module deepens the view of engineers on the responsibility of mining operations regarding environmental belongings like • Rehabilitation (reclamation and recultivation). • Assessing and minimizing intervention. • Compensation measures. • Environmental impact and spatial significance. • Resettlement problems. • Land rehabilitation. • Internal and external water cycles involved in raw materials operations. • Dust and noise emissions/emissions				
Learning outcomes	Upon successful completion of this module, the students will, through assessment activities, show evidence of their ability to: 1. Describe and interpret the market pressures under which raw materials companies must operate today. 2. Summarize and evaluate the current requirements for environmental protection as applied to raw material extraction. 3. Reflect on the awareness of the whole question of environmental protection. 4. Recognize and evaluate specific problems by given case studies				
Literature	1. Hustrulid WA. Open Pit Mine Planning and Design. CRC Press; 2013. 2. Azcue JM. Environmental Impacts of Mining Activities. Emphasis on Mitigation and Remedial Measures. Springer; 2011 3. Lottermoser B. *Mine Wastes.* Heidelberg:Springer; 2010 4. Stoll RD, Niemann-Delius C, Drebenstedt C, Müllensiefen K. *Der* Braunkohlentagebau. Springer; 2009 5. Spitz K. Mining and the Environment from Ore to Metal. CRC Press; 2008.				
Form of teaching	Lecture (2 UoI) Recitation (1 UoI) Field Trip (1 UoI)				
Assessment method	Written examination (60 min.) and academic performance				
Associated study program	B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering				
Prerequisites for participation	None				
Requirements for receiving credit points	Passing the module				

Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.

ENVE302 – PRINCIPLES OF WATER TECHNOLOGY

Module title	Principles of Water Technology			**Module code**	ENVE302
Duration	1 semester	**Semester**	Fall	**Module start**	5
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Dr. Ts. Ariuntuya			**Language**	English
Contents	Introduction of basic principles of water related subjects namely, water supply, wastewater characteristic, and urban drainage.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Interpret components of biogeochemical cycles in ecosystem 2. Identify the water quality and wastewater characteristic monitoring and function of water treatment systems. 3. Solve the problems by hydraulic and hydrological equations for water distribution and wastewater drainage system. 4. Select methods for water sampling and conduct measurements with multi-parameters probes and devices. 5. Analyze environmental technologies for water and wastewater treatment system.				
Literature	1. Nathanson JA, Schneider RA. Basic Environmental Technology: Water Supply, Waste Management and Pollution Control. 6th Edition. Pearson; 2014. 2. Viessman WJr, Hammer MJ, Perez E. Water Supply and Pollution Control. 8th edition. Pearson; 2014. 3. Mark J, Hammer S, Mark J, Hammer J. Water and wastewater technology. 7th edition. Pearson; 2011.				
Form of teaching	Lecture (2 UoI) Recitation/Field trip (2 UoI)				
Assessment method	Written examination (90 min.) and academic performance.				
Associated study program	B.Sc. Environmental Engineering				
Prerequisites for participation	Completion of semesters 1-4				
Requirements for receiving credit points	Passing the module				
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.				

ENVE305 – CLIMATE CHANGE

Module title	Climate Change			**Module code**	ENVE305
Duration	1 semester	**Semester**	Fall	**Module start**	5
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. G. Gantuya			**Language**	English
Contents	This course is aimed to provide the broad scientific concepts for students to understand the drivers and impacts of anthropogenic climate change, negative impacts, international agreements on global climate change. The Contents of this module includes: • Introduction to atmosphere • Climate data collection and interpretation • Global energy balance • Greenhouse gasses in the atmosphere and climate • Recent global warming and its impacts • Climate models • International agreements • Future climate change projections				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Identify the basics of climate 2. Analyze the reasons of climate change 3. Discuss the scientific evidence of climate change 4. Visualize the climate change 5. Discuss the problem and its effects 6. Choose the possible solutions				
Literature	1. Cole MW, Lueking AD, Goodstein DL. Science of the Earth, Climate and Energy, World Scientific Publishing; 2018. 2. Mann M. The Hockey Stick and the Climate Wars: Dispatches from the Front Lines, Columbia University Press; 2013. 3. Oliver JE, Hidore JJ. Climatology: An Atmospheric Science, 3rd edition. Prentice Hall; 2010.				
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)				
Assessment method	Written examination (60 min.) and academic performance				
Associated study program	B.Sc. Environmental Engineering				
Prerequisites for participation	Introduction to Geosciences				
Requirements for receiving credit points	Passing the module				
Grading system	The final grade consists of the academic performance during the module accounting for 60% and the module examination accounting for 40%				

PROG151 – MATLAB PROGRAMMING

Module title	Matlab programming			**Module code**	PROG151
Duration	1 semester	**Semester**	Fall or Spring	**Module start**	5, 6, 7, 8
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. G. Gantuya			**Language**	English
Contents	This course aims to introduce the elements and practicalities of computer programming through the MATLAB mathematical computing environment. This course comprises the following topics: • MATLAB introduction and environment • Variables, data types and operators • Vectors and matrices • Selection statements • Loop statements • Script and function • Plotting and colour maps • String manipulation • Data structures • File input/output • GUI introduction				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Become familiar with MATLAB environment 2. Understand the fundamentals of programming 3. Manipulate vectors, matrices and strings 4. Use built-in commands and mathematical functions to make calculation 5. Solve simple problems using selection and loop statements 6. Create and call user-defined functions 7. Draw various types of graphics 8. Design and construct data structures when required 9. Read/write data from/to files to manipulate 10. Develop program with simple GUI				
Literature	1. Attaway S. MATLAB: A practical Introduction to Programming and Problem Solving. 3rd edition. Elsevier; 2013. 2. Lent CS. Learning to program with MATLAB. 1st edition. Wiley; 2013.				
Form of teaching	Lecture (1 UoI) Laboratory (3 UoI)				
Assessment method	Written examination (90 min) and academic performance.				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronics Engineering				
Prerequisites for participation	Algorithm and Programming				

Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 70% and the module examination accounting for 30%.

EEEJ301 – RENEWABLE ENERGY

Module title	**Renewable Energy**			**Module code**	EEEJ301
Duration	1 semester	**Semester**	Spring	**Module start**	6th
Credit points	4 CP	**Workload**	120 h	**Contact hours**	48 h
				Individual study	72 h
Module coordinator	Prof. P. Ariunbolor			**Language**	English
Contents	This module introduces students to renewable energy sources, energy generation techniques, and the efficiency of energy usage: • Renewable energy sources (overview of hydropower, wind power, solar energy, geothermal systems and biomass): ecological advantages, challenges for implementation (cost, suitable locations, acceptance, and negative environmental impacts). • Solar Energy: Power Generation with Solar Energy; Solar insolation: Energy sources for photovoltaics, Photovoltaic technologies (Si-wafer based vs. Thin-Film PV), Solar cell materials • Wind power: wind characteristics (velocity distribution, density), power calculation and power curve of a wind turbine, structure of wind turbines (vertical, horizontal) • Hydroelectric power: Rainfall and run-off measurements and plotting of various curves for estimating stream flow and size of reservoir, power plants design, construction and operation of different components of hydro-electric power plants • RETSCreen Software: https://www.nrcan.gc.ca/maps-tools-and publications/tools/modeling-tools/retscreen/7465 Students will have the opportunity to learn the software RETScreen to design PV, Wind and Bioenergy systems. Efficiency of energy usage in industry, at the municipal and domestic level (e.g. heating/insulation, efficiency of electrical appliances, energy efficiency in the transportation sector).				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Explain the principles of the technical construction of renewable energy systems (Energy Sources, Solar Photovoltaic, Solar Tracking, Charge Controller and Inverter, Wind Power Systems, Wind Turbine Control, Biomass Technologies, Geothermal Power Generation, Energy from Water, Fuel Cells, Generators), 2. Design of wind- and solar-parks 3. Assess the efficiency of energy production and consumption for typical examples from Mongolia (e.g. thermal power plants, insulation of buildings, transport sector) 4. Apply knowledge about the preconditions for an effective usage of energy system				
Literature	1. Demirel Y. Energy - Production, Conversion, Storage, Conservation, and Coupling. Springer, London; 2016. 2. Buchla DM, Kissel TE, Floyd TL. Renewable Energy Systems. Pearson; 2015.				
Form of teaching	Lecture (2 UoI) Recitation (1 UoI) Field trip (1 UoI)				
Assessment method	Written examination (90 min.) and academic performance.				

Associated study program	B.Sc. Mechanical Engineer B.Sc. Environmental Engineering B.Sc. Energy and Electrical Engineering B.Sc. Raw Materials and Process Engineering
Prerequisites for participation	None
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%.

MECH302 – PRODUCTION PROCESS TECHNOLOGY

Module title	Production Process Technology			**Module code**	MECH302
Duration	1 semester	**Semester**	Fall	**Module start**	5th
Credit points	6 CP	**Workload**	180 h	**Contact hours**	54 h
				Individual study	126 h
Module coordinator	Prof. Klein			**Language**	English
Contents	Basic principles and typical production processes and main process groups (DIN 8580); relationship between design form, material and production processes as the basis for manufacturing technology; details of the main material groups; process development and the basic procedures for component production and assembly in machine-tool and vehicle manufacturing using examples; main factors affecting, and basic principles of, the organization of production for manufacturing and assembling components; principles of geometric production measurement technology, metrological procedures, equipment and test procedures for machine tools.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Systematically compare and evaluate particular production processes under given circumstances. 2. Design customized production processes, allocate resources, and determine the economic parameters (times and costs).				
Literature	1. Kalpakjian S, Schmid SR. Manufacturing Engineering and Technology. 7th edition. Pearson; 2013. 2. Hooford W. Metal Forming. 3rd edition. Cambridge University Press; 2007. 3. Groover M. Fundamentals of Modern Manufacturing. 7th edition. Wiley;2007. 4. Koenig D. Manufacturing Engineering. 3rd edition. American Society of Mechanical Engineers; 2006. 5. Groza J. Material Processing Handbook. 1st edition. CRC Press; 2006. 6. Krar S. Metalworking and Manufacturing Technology. McGraw-Hill; 1998. 7. Karlson L. Modeling in Welding, Hot Powder Forming and Casting. Asm Intl; 1997. 8. Krause C. Heat Treatment and Surface Engineering. ASM International; 1988.				
Form of teaching	Lecture (2 UoI) Recitation (1 UoI) Laboratory (0.5 UoI) Fieldtrip (1 UoI)				
Assessment method	Written examination (120 min.) and academic performance				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	Materials Science; Engineering Mechanics I-II				
Requirements for receiving credit points	Passing the module				
Grading system	The final grade consists of the academic performance during the module, accounting for 30%, and the module examinations accounting for 70%				

MECH403 – PRODUCTION AND PROCESS SIMULATION

Module title	Production and Process Simulation			**Module code**	MECH403
Duration	1 semester	**Semester**	Fall	**Module start**	7th
Credit points	4 CP	**Workload**	120 h	**Contact hours**	36 h
				Individual study	84 h
Module coordinator	Prof. N. Odbileg			**Language**	English
Contents	Introduction to main strategies of: • Modeling • Simulation • Application using software tools for industrial processes like manufacturing, mineral processing and mining.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Introduction to system theory: classification, definition of terms, model, simulation. This includes the creation of mathematical models and on the other hand, the application of a simulation technology (computer program) to the industries. 2. Students know the basic system classes of simulations: concentrated dynamic systems, distributed dynamic system, discrete systems and discrete-continuous systems. 3. Module provides basic skills for problem solving with an autonomous simulation. 4. Implementation of the Digital Twin for industrial processes like manufacturing, mineral processing and mining. 5. Layout planning for new and existing factories and plants. 6. Cycle time planning and optimization. 7. Visualization. 8. Data import and export opportunities.				
Literature	1. The literature depends on computer programs (CIROS, Mining and Mineral processing software) chosen, on-line tutorials are available 2. Angermann AM, Beuschel MR, Wolhlfarth U. Matlab – Simulink – Stateflow. De Gruyter-Oldenbourg; 2004. 3. Zeigler BP, Kim TG. Theory of Modeling and Simulation. 2nd edition. San Diego: Academic Press; 2000.				
Form of teaching	Lecture (1 UoI) Laboratory (2 UoI)				
Assessment method	Written examinations (90 min.) and academic performance				
Associated study program	B.Sc. Mechanical Engineering				
Prerequisites for participation	Introduction to Computer Science; Engineering Design; Engineering Thermodynamics CAD; Finite Element Method.				
Requirements for receiving credit points	Passing the module				
Grading system	The final grade consists of the academic performance during the module, accounting for 30%, and the module examinations accounting for 70%				

LANGUAGE ELECTIVE MODULES

ENGL010 – ENGLISH

Module title	English C1			**Module code**	ENGL010
Duration	1 semester	**Semester**	Fall	**Module start**	BEP, 1st
Credit points		**Workload**		**Contact hours**	96 h
				Individual study	
Module coordinator	Prof. Ch. Gunpilmaa, D. Suvdanchuluun			**Language**	English
Contents	**Grammar Syllabus:** Gerund/ infinitive, the present and stative verbs, used to and would, passive, causative, future, conditionals and wishes, inversion, modal verbs, relatives, indirect speech and reporting verbs, articles and punctuation **Vocabulary and Topical Syllabus:** ambition, career success, pastimes and hobbies, family, media, social problems, technology, science jobs, health problems, school, college, university, advertising, communication				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Express themselves clearly and talk about complex facts in a structured and detailed way. 2. Write correctly to a large degree on a number of complex topics. 3. Follow and grasp different kinds of spoken language, live or broadcast 4. Read with ease complex texts and summarize correctly and concisely written texts and oral presentations in their own words. 5. Deliver a presentation using a clear organized structure, helpful slides, and signposting 6. Integrate their reading, writing, and speaking skills to promote creative thinking and independent learning				
Literature	1. Dooley VEJ, Edwards L. Upstream Advanced C1, Express Publishing; 2005. 2. Evans V, Edwards L, Dooley J. Upstream Advanced C1, Workbook, Express Publishing; 2005.				
Form of teaching	Recitation (14 UoI in BEP, 8 UoI in 1st Semester in B.Sc. Programs)				
Assessment method	(70%) = Final examination (written and oral) (30%) = Short presentations, in-class assignments, quizzes,mid-term exam				
Associated study program	BEP / 1st Semester of Bachelor programs				
Prerequisites for participation	Participants must have successfully completed level B2 or have a comparable knowledge of English				
Requirements for receiving credit points	• 80% attendance • Academic performance • Final examination : written and oral examination • Students who failed the exam in the first semester may retake the module in the second semester				
Grading system	The modes of assessment total 100%.				

ENGL150 – ACADEMIC WRITING I

Module title	Academic Writing I			**Module code**	ENGL150
Duration	1 semester	**Semester**	Fall and Spring	**Module start**	1st, 2nd, 3rd, 4th, 5th, 6th
Credit points	3 CP	**Workload**	90 h	**Contact hours**	48 h
				Individual study	42 h
Module coordinator	D. Suvdanchuluun			**Language**	English
Contents	The goal of this module is to offer an introduction to formal writing to the undergraduates which is required in their academic studies at the university. The objectives of the module are to familiarize learners with a formal tone, use of the third-person rather than first-person, focus on the topic, precise word choice on the one part, and to introduce them with a paragraph and essay structures, unity and coherence, outlines, first and second drafts and editing on the other part. The goal and objectives will be achieved by offering the below-mentioned syllabus: • Paragraphs • The five-paragraph essay • Unity within a paragraph and within an essay • Coherence • Brainstorming and making outlines • Drafts and editing • Descriptive essays • Formal emails • CV and motivation or cover letters • Process Analysis Essays • Cause and Effect Essays • Argumentative Essays • Opinion Essays • Reports • Lab report discussions • Reviews				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Recognize, understand and recall the structural components of academic writing at paragraph and essay levels. 2. Identify and apply formal register and tone. 3. Analyze and evaluate different types of academic writing, e.g. essays, reviews and reports. 4. Summarize the main points of academic texts in writing. 5. Organize and present arguments in a logical fashion. 6. Apply cohesive devices. 7. Create their own pieces of academic writing. 8. Critically examine and improve upon their own writing. 9. Apply the skills acquired in the module to their further academic studies .				
Literature	1. Savage A, Mayer P. Effective Academic Writing 2; 2006. 2. Jordan RR. Academic Writing Course, Longman; 2003. 3. Barnet S, Stubbs M. Practical Guide to Writing, Harper Collins. Websites: IELTS Writing Skills, British Council, BBC Learn English Writing skills; 1985.				

Form of teaching	Recitation (4 UoI)
Assessment method	Assignments: written and oral in the form of essays or presentations
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering
Prerequisites for participation	C1 English level
Requirements for receiving credit points	Passing the module.
Grading system	Continuous assessment (presentations and essays): Pass or Fail

MNGL150 – MONGOLIAN STYLISTICS

Module title	Mongolian Stylistics			**Module code**	MNGL150
Duration	1 semester	**Semester**	Fall and Spring	**Module start**	1st, 2nd, 3rd, 4th,
Credit points	2 CP	**Workload**	60 h	**Contact hours**	24 h
				Individual study	36 h
Module coordinator	D. Suvdanchuluun			**Language**	English
Contents	Participants will read texts of different genres, discuss text comprehension and analyze how the texts are structured and which stylistic means, grammatical structures and vocabulary are used. Grammar and spelling rules will be revised. Participants will practice text analyses, summaries and, furthermore, apply their knowledge of style, academic vocabulary and grammar to their own text production. Participants will also learn how to express their thoughts in oral speech, e.g. in discussions and presentations.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Comprehend and analyze texts of different genres and recognize their specific characteristics, 2. Write text summaries, 3. Structure their thoughts in a text 4. Write a formal letter, an application and other short texts as well as an essay with correct grammar, spelling and using appropriate stylistic means 5. Give an academic presentation using appropriate language				
Literature	1. Мөнхцэцэг С. Орчин цагийн монгол хэлний найруулга зүйн дасгал, Улаанбаатар; 2016. 2. Оюунбат Ц, Мөнхцэцэг С. Монгол хэлний найруулга зүй, Улаанбаатар; 2012. 3. Мон судар. Монгол хэлний хураангуй тайлбар толь, Мон судар; 2009. 4. Сүхбаатар Ц. Монгол хэлний найруулга зүй, Улаанбаатар; 2007.				
Form of teaching	Recitation (2 UoI)				
Assessment method	Final paper and academic performance (tests and homework assignments)				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	C1 level of English and successful completion of Academic Writing				
Requirements for receiving credit points	At least 70% of the course grade will be based on evaluation of the formal writing. Formal research writing assignments are required				
Grading system	Preliminary Research Portfolio: 20%				

	Critical Presentation: 30% Final Portfolio: 50%

HIST150 – EUROPEAN HISTORY

Module title	European History			**Module code**	HIST150
Duration	1 semester	**Semester**	Fall	**Module start**	5th, 7th
Credit points	3 CP	**Workload**	90 h	**Contact hours**	48 h
				Individual study	42 h
Module coordinator	Robin Charpentier			**Language**	English
Contents	European Pre-History: Themes, Questions in the Study of History • Time and Space Considerations; How and Why we Study History • Stone Age: Paleolithic and Neolithic Early European Civilization: • Early Bronze Age – The Minoans • Archaic Greece • Classical Greek Period • Hellenistic Culture • Central European Late Iron Age Cultures (Hallstatt, La Tène) • City of Rome to Roman Kingdom/Punic Wars • Formation and Expansion of Roman Empire • The Fall of the Roman Empire Mid-Term Exam Late Antiquity/Early Middle Ages • Nomadic Conquests of Western Roman Empire • Eastern Roman Empire and Byzantium • Holy Roman Empire • Age of Vikings • Muslim Conquests • Holy Wars: The Crusades • The Mongol Conquests in its Western Empire and in Eastern Europe; Pax Mongolica				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Identify factors associated with the major cultural changes that have contributed to and shaped Europeans' distinctive worldview 2. Compare and contrast these factors with relevant time periods in Mongolian history 3. Think critically about: the role and presence/absence of original sources; and about the role of spatiality and time in the creation of an historical record.				
Literature	1. Duiker WJ, Spielvogel JJ. World History 8th edition; 2016. 2. Spielvogel JV. Glencoe World History, Glencoe-McGraw Hill. Various primary source materials in photocopy; 2008.				
Form of teaching	Recitation (4 UoI)				
Assessment method	(70%) = Written final examination				

	(30%) = Active in-class participation (15%); tests, mid-term exam, final oral presentation (15%)
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering
Prerequisites for participation	English at the C1 level in all 4 skills
Requirements for receiving credit points	1. Attendance is recorded for those arriving before the scheduled start time 2. Participation means: volunteering answers; asking and/or responding to questions; paying attention; actively focusing on in-class tasks; turning in assignments on time and with good quality
Grading system	The modes of assessment total 100%

GERL151 – GERMAN A1.1

Module title	Deutsch A1.1/ German A1.1			**Module code**	GERL151
Duration	1 semester	**Semester**	Fall	**Module start**	1st, 3rd, 5th, 7th
Credit points	3 CP	**Workload**	90 h	**Contact hours**	48 h
				Individual study	42 h
Module coordinator	B. Batsuren, B. Bolormaa			**Language**	German
Contents	Basic knowledge and skills in pronunciation, spelling (alphabet), intonation (word and sentence stress) of the German language. Main topics are first contact, classroom language, languages/ countries/ sights, jobs, living, time, numbers, making appointments, how to find the way in the city and in buildings, means of transport. Grammar problems, e.g. sentence structure (statements and questions), present tense of verbs, past tense of "haben" and "sein", negation, articles, possessive pronoun, use of prepositions (place/time), cardinal numbers, dative and accusative cases, are introduced and practiced. Basic information about German geography and culture is introduced.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Know the basic principles of pronunciation, intonation, spelling of German. 2. Construct grammatically and semantically correct sentences, produce simple statements and questions in oral communication as well as in writing. 3. Introduce themselves and others and make themselves understood in the classroom. 4. Talk about the geographical location of places and say where people work/study and ask for the way. 5. Describe houses/apartments. 6. Tell the time and make appointments. 7. Apply integrated learning strategies to improve upon their learning independently.				
Literature	1. Paar-Grünbichler F, Finster WKJ. Panorama. Deutsch als Fremdsprache. Kursbuch A1 und Übungsbuch A1, Cornelsen Verlag; 2018. 2. Funk K. Studio 21. Das Deutschbuch. A1.1, Cornelsen Verlag; 2013.				
Form of teaching	Recitation (4 UoI)				
Assessment method	Written examination (90 min.) and academic performance (tests and homework assignments)				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	C1 English level				

Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module (30%) and the module examination (70%).

GERL152 – GERMAN A1.2

Module title	Deutsch A1.2/ German A1.2			**Module code**	GERL152
Duration	1 semester	**Semester**	Spring	**Module start**	2nd, 4th, 6th, 8th
Credit points	3 CP	**Workload**	90 h	**Contact hours**	48 h
				Individual study	42 h
Module coordinator	B. Batsuren, B. Bolormaa			**Language**	German
Contents	Basic knowledge and skills in pronunciation, spelling, grammar and vocabulary of the German language as well as basic aspects of German culture. The main topics include: food/shopping, professions, daily routine/everyday life, holidays, seasons/weather, fashion, the human body/health. Grammar points include: modal verbs, perfect tense, comparison, adjectives, imperative and personal pronouns. In this module A1 (beginner) level is completed.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Pronounce and spell German words and intone sentences correctly. 2. Construct grammatically and semantically correct sentences and make simple statements in oral communication as well as in writing. 3. Understand simple everyday conversation and short and simple oral material. 4. Talk about professions, clothes, the weather, the human body, feelings, food, holidays and daily routines. 5. Give recommendations and write simple letters. 6. Understand weather forecasts, recipes and various other short texts of different genres. 7. Provide basic facts about Germany and German culture. 8. Apply integrated learning strategies to improve upon their learning independently.				
Literature	1. Paar-Grünbichler F, Finster WKJ. Panorama. Deutsch als Fremdsprache. Kursbuch A1 und Übungsbuch A1, Cornelsen Verlag; 2018. 2. Funk K. Studio 21. Das Deutschbuch. A1.1, Cornelsen Verlag; 2013.				
Form of teaching	Recitation (4 UoI)				
Assessment method	Written examination (90 min.) and oral examination (15 min.) as well as academic performance (tests and homework assignments)				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	Successful completion of the module German A1.1 or equivalent knowledge of German				
Requirements for receiving credit points	Passing the module				

Grading system	The final grade consists of the academic performance during the module accounting for and the module examination accounting for 70%.

GERL251 – GERMAN A2.1

Module title	Deutsch A2.1/ German A2.1			**Module code**	GERL251
Duration	1 semester	**Semester**	Fall	**Module start**	1st, 3rd, 5th, 7th
Credit points	3 CP	**Workload**	90 h	**Contact hours**	48 h
				Individual study	42 h
Module coordinator	B. Batsuren, B. Bolormaa			**Language**	German
Contents	This module will pursue further work to improve students' skills in pronunciation and spelling as well as grammar and vocabulary. Language tasks will include: talking about one's self and one's family, describing people and pictures, extending invitations and congratulating people, expressing one's opinion, talking about trips and one's hobbies, describing one's emotions, discussing advertisements and the media, ordering food in a restaurant and explaining one's leisure time activities The grammar points covered in this module include: subordinate clauses with *weil, dass*, and *ob* comparative and superlative adjectives, possessive article and adjectives in the dative case, the genitive /s/, main clauses with *aber* and *oder* , the modal verb sollen, reflexive pronouns, adverbs of time, verbs with prepositions, indefinite pronouns, personal pronouns in the dative case. Further understanding of aspects of German culture.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Apply their knowledge of German pronunciation, intonation and spelling to new words and sentences. 2. Construct grammatically and semantically correct sentences at a basic level. 3. Use proper vocabulary to discuss topics such as family, biography, languages, travelling, leisure and media. 4. Produce written texts that go beyond the sentence level. 5. Interact successfully and appropriately in everyday oral communication. 6. Understand short oral texts. 7. Grasp the meaning of various short written texts. 8. Describe in more detail many aspects of German culture (e.g. migration, literature, geography). 9. Apply integrated learning strategies to improve upon their learning independently.				
Literature	1. Paar-Grünbichler F, Finster WKJ. Panorama. Deutsch als Fremdsprache. Kursbuch A1 und Übungsbuch A1, Cornelsen Verlag; 2018. 2. Funk K. Studio 21. Das Deutschbuch. A1.1, Cornelsen Verlag; 2015.				
Form of teaching	Recitation (4 UoI)				
Assessment method	Written examination (90 min.) and academic performance (tests and homework assignments)				

Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering
Prerequisites for participation	Successful completion of the module German A1.2 or equivalent knowledge of German
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for and the module examination accounting for 70%.

GERL252 – GERMAN A2.2

Module title	Deutsch A2.2/ German A2.2			**Module code**	GERL252
Duration	1 semester	**Semester**	Spring	**Module start**	2nd, 4th, 6th, 8th
Credit points	3 CP	**Workload**	90 h	**Contact hours**	48 h
				Individual study	42 h
Module coordinator	B. Batsuren, B. Bolormaa			**Language**	German
Contents	This module will pursue further work to improve students' skills in pronunciation and spelling as well as grammar and vocabulary. The language tasks of this module include: talking about moving from the countryside to the city; discussing various forms of culture, applying for a job and describing one's future career plans; celebrations and holidays; emotions and films; innovative ideas and inventions The grammar points covered in this module include: modal verbs in the past, adverbs of time, comparison of the preterite and perfect verb tenses, subordinate clauses with *wenn, als um…zu* and *damit*, the verb *werden*, nominalization, polite requests, prepositions and verbs with the dative case, verbs with accusative complements, genitive case, relative clauses with in and mit, *werden/wurden*. Acquisition of additional aspects of German culture. Completion of level A2 (elementary).				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Correctly apply their knowledge in the pronunciation, intonation and spelling of German to new words and sentences. 2. Construct grammatically complex and semantically correct sentences. 3. Use proper vocabulary to discuss topics such as culture and arts, the workplace and professions, celebrations and holidays, country and city life and inventions and technology. 4. Produce more complex written text. 5. Interact effectively and appropriately in everyday speaking situations. 6. Understand various types of short written texts. 7. Grasp the core meaning of a variety of audio and video material of intermediate difficulty. 8. Provide basic facts about German culture, geography and society. 9. Apply integrated learning strategies to improve upon their learning independently.				
Literature	1. Paar-Grünbichler F, Finster WKJ. Panorama. Deutsch als Fremdsprache. Kursbuch A2 und Übungsbuch A2, Cornelsen Verlag; 2018. 2. Funk K. Studio 21. Das Deutschbuch. A2.2, Cornelsen; 2015.				
Form of teaching	Recitation (4 UoI)				
Assessment method	Written examination (90 min.) and oral examination (15 min.) as well as academic performance (tests and homework assignments)				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				

Prerequisites for participation	Successful completion of the module German A2.1 or equivalent knowledge of German
Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for and the module examination accounting for 70%.

GERL351 – GERMAN B1.1

Module title	Deutsch B1.1/ German B1.1			**Module code**	GERL351
Duration	1 semester	**Semester**	Fall	**Module start**	1st, 3rd, 5th, 7th
Credit points	3 CP	**Workload**	90 h	**Contact hours**	48 h
				Individual study	42 h
Module coordinator	B. Batsuren, B. Bolormaa			**Language**	German
Contents	Development and application of the knowledge and skills acquired in the A1 and A2 levels. Additional topics include: German/European history, men/women, aspects of professional life and the education system. Grammar points include: subordinated sentences, past tense of irregular verbs, word formation and conditional forms.				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Interact adequately in most situations of everyday life. 2. Speak in a simple but well-structured way about topics like politics, history, and culture. 3. Give recommendations; agree or disagree; express their opinion and give reasons. 4. Describe dreams, wishes and goals; and report about experiences and events. 5. Read and understand short newspaper articles. 6. Write texts on a number of everyday topics that consist of several paragraphs and employ cohesive structures to organize the text as a whole. 7. Deliver short presentations on a number of topics related to everyday life, history and culture. 8. Understand everyday conversations as well as audio and video material of intermediate difficulty. 9. Apply integrated learning strategies to improve upon their learning independently.				
Literature	1. Paar-Grünbichler F, Finster WKJ. Panorama. Deutsch als Fremdsprache. Kursbuch B1 und Übungsbuch B1, Cornelsen Verlag; 2018. 2. Funk K, Kiontke W. Studio 21. Das Deutschbuch. B1.1, Cornelsen Verlag; 2015.				
Form of teaching	Recitation (4 UoI)				
Assessment method	Written examination (120 min.) and academic performance (tests and homework assignments)				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	Successful completion of the module German A2.2 or equivalent knowledge of German				

Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for and the module examination accounting for 70%.

GERL352 – GERMAN B1.2

Module title	Deutsch B1.2/ German B1.2			**Module code**	GERL352
Duration	1 semester	**Semester**	Spring	**Module start**	2nd, 4th, 6th, 8th
Credit points	3 CP	**Workload**	90 h	**Contact hours**	48 h
				Individual study	42 h
Module coordinator	B. Batsuren, B. Bolormaa			**Language**	German
Contents	Development and application of the knowledge and skills acquired in the A1 and A2 levels. Additional topics include: climate/environment, conflicts, generations and age, migration and (European) politics. Grammar points include: future and past perfect tense, genitive case, conjunctions and subordinated sentences, word formation and phrasal verbs. Completion of level B1 (intermediate).				
Learning outcomes	On successful completion of this module, the students should be able to: 1. Interact adequately and appropriately in all situations of everyday life. 2. Speak and write in a simple but well-structured way about topics like climate change and the environment, politics, history and culture. 3. Express their opinion and give reasons as well as provide arguments. 4. Talk about advantages and disadvantages, give alternatives, comment on various topics of intermediate difficulty. 5. Express their problems, fears and hopes both orally and in writing. 6. Understand and write basic literary texts. 7. Grasp the meaning of a variety of discursive texts of intermediate difficulty. 8. Understand conversations as well as authentic audio and video material on a number of topics of intermediate difficulty. 9. Give presentations. 10. Apply integrated learning strategies to improve upon their learning independently				
Literature	1. Paar-Grünbichler F, Finster WKJ. Panorama. Deutsch als Fremdsprache. Kursbuch B. und Übungsbuch B1, Cornelsen Verlag; 2018. 2. Funk K, Kiontke W. Studio 21. Das Deutschbuch. B1.2, Cornelsen Verlag (tests and homework assignments; 2015.				
Form of teaching	Recitation (4 UoI)				
Assessment method	Written examination (120 min.) and oral examination (15 min.) as well as academic performance				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	Successful completion of the module German B1.1 or equivalent knowledge of German				

Requirements for receiving credit points	Passing the module
Grading system	The final grade consists of the academic performance during the module accounting for and the module examination accounting for 70%.

GERL451 – GERMAN B2.1

Module Title	Deutsch B2.1/German B2.1			**Module code**	GERL451
Duration	1 semester	**Semester**	Fall	**Module start**	1st, 3rd, 5th, 7th
Credit Points	3 CP	**Workload**	90 h	**Contact hours**	48 h
				Individual study	42 h
Module coordinator	B. Batsuren, B. Bolormaa			**Language**	German
Contents	Development and application of the knowledge and skills acquired at A1, A2 and B1 levels. Additional topics include: Language learning methods live and work in big cities, digital worlds and climate change. Grammar points include: conjunctions and subordinated sentences, passive forms with modal verbs, relative clauses, word formation and conditional are introduced or revised.				
Learning Outcomes	Upon successful completion of this module, students are able to: 1. understand the main and detail ideas of complex texts on concrete and abstract topics; 2. communicate so spontaneously and fluently that a normal conversation with native speakers is easily possible without much effort on either side. 3. produce clear, detailed text on a wide range of subjects, explaining a point of view on a topical issue giving the advantages and disadvantages of various options. 4. reflect the structure of emails and write emails with link forms 5. compare and comment on information 6. interpret graphics 7. Arranging sections of text logically and arguing 8. write a structured statement 9. respond to speeches and conduct discussions 10. summarize articles in writing and orally 11. write formal emails				
Literature	1. Braun B, Mautsch FJ, Schmeiser SS. Kompass DaF B2.1 Deutsch für Studium und Beruf. Das Kurs-und Übungsbuch. B2.1, Ernst Klett Sprachen Verlag; 2020.				
Form of teaching	Recitation (4 UoI)				
Assessment methods	Written examination (120 min.) and academic performance (tests and homework assignments)				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	Successful completion of the module German B1.2 or equivalent knowledge of German				
Requirements for receiving credit points	Passing the module.				

Grading system	The final grade consists of the academic performance during the module accounted for 30% and the module examination accounted for 70%

GERL452 – GERMAN B2.2

Module Title	Deutsch B2.2/German B2.2			**Module code**	GERL452
Duration	1 semester	**Semester**	Spring semester	**Module start**	2nd, 4th, 6th, 8th
Credit Points	3 CP	**Workload**	90 h	**Contact hours**	48 h
				Individual study	42 h
Module coordinator	B. Batsuren, B. Bolormaa			**Language**	German
Contents	Development and application of the knowledge and skills acquired at A1, A2 and B1 levels. Additional topics include: education/dual system, healthy foods/eating, sports/health insurance, motivation and praise and intercultural Competence. Grammar points include: conjunctions and subordinated sentences, indirect speech Subjunctive I, modal sentences, Partizip I and II-forms as an adjective, unreal conditions, unreal comparison sentences, word formation and phrasal verbs are introduced or revised. Completion of level B2 (Upper-Intermediate).				
Learning Outcomes	Upon successful completion of this module, students are able to: 1. reflect/recognize the structure of emails and use emails with link forms 2. compare and comment on information 3. interpret graphics 4. arrange texts logically and argue 5. write a structured statement 6. respond to speeches and conduct discussions 7. summarize articles in writing and orally 8. write formal emails				
Literature	1. Braun B, Mautsch FJ, Schmeiser SS. Kompass DaF B2.1 Deutsch für Studium und Beruf. Das Kurs-und Übungsbuch. B2.1, Ernst Klett Sprachen Verlag; 2020.				
Form of teaching	Recitation (4 UoI)				
Assessment methods	Written examination (120 min.) and oral examination (15 min.) as well as academic performance (tests and homework assignments)				
Associated study program	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering B.Sc. Energy and Electrical Engineering B.Sc. Mechatronic Engineering				
Prerequisites for participation	Successful completion of the module German B2.1 or equivalent knowledge of German				
Requirements for receiving credit points	Passing the module.				

Grading system	The final grade consists of the academic performance during the module accounted for 30% and the module examination accounted for 70%