GERMAN - MONGOLIAN INSTITUTE FOR RESOURCES AND TECHNOLOGY

Basic Engineering Program

MODULE HANDBOOK (1st – 2nd semester)

Content

Introduction

The Basic Engineering Program is a preparatory year for GMIT's Bachelor programs; it prepares students for their application to study GMIT's undergraduate programs. Essentially, it includes teaching content which corresponds to the final two years of schooling in other countries, e.g. Germany. In addition the Basic Engineering Program also imparts key competences which will play an important role in the bachelor courses. Language of instruction is English.

The Handbook provides Aims, Objectives, and Learning Outcomes of the Basic Engineering Program at the German-Mongolian Institute of Technology and Resources (GMIT)

Study Plan – Basic Engineering Program

	1 Semester	2 Semester
1	BEP Mathematics I 8cp (4UoL, 4UoR)	BEP Mathematics II 8cp (4UoL, 4UoR)
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3		
4		
5		
6		
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8		
9	BEP – Physics I 6cp (2UoL, 4UoR)	BEP – Physics II 6cp (2UoL, 4UoR)
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11		
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14		
15	BEP – Chemistry /Fall/ 6cp (2UoL, 2UoR)	BEP – Chemistry /Spring/ 6cp (2UoL, 2UoR)
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19	English Level B2 12cp	English Level C1 12cp
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30		
CP total	30	30

BEP MATH1 – Mathematics I

Module Title	Mathematics	**Module-Code**	BEP-MATH1
Workload	120 h	**Contact hours**	64 h
		Individual study	56 h
Module Coordinator	Lecturer Dr. L. Oyuntsetseg	**Language**	English

Syllabus	1. Vectors in a plane, scalar product 2. Lines in a plane 3. Planes, cross product, distance from a point to a line or plane 4. Geometry with trigonometry 5. Modeling with equation and inequalities 6. Some functions, exponential, logarithmic and trigonometric functions 7. Basics of probability theory, Addition rule, Multiplication rule, Counting rule 8. Conditional probability, Bayes theorem, Independence 9. Matrices, elementary transformations, row echelon form 10. Solving system of linear equation by Gauss elemination, hogeneous linear equations system 11. Linear space, linear dependence, basis 12. Sequence, Induction method, requerrent sequence, Some financial problem 13. Logarithmic functions, trigonometric functions
Learning outcomes	This module will prepare students to progress to Bachelor's programs of GMIT in mathematics. The students will be given an introduction to mathematics for higher mathematics. On successful completion of this module, the students should be able to: 1. Continue higher mathematics. 2. Have some basics of analytical geometry, probability theory, linear algebra, and mathematical analysis. 3. Solve problems in analytical geometry, probability theory, linear algebra, and mathematical analysis. 4. Read and use some books in mathematics. 5. Understand in English lectures. 6. Use some problems in physics and mechanics.
Literature	1. Stewart James,RedlinLothar, Aleem Watson, Precalculus, 6th edition, 2012, 2. Probability DeMYSTiFied, Allan G.Bluman, 3. Shaum's outline of Theory and problems of Probability 4. Lang, Linear Algebra 5. Calculus, Early transcendentals, 6th edition,James Stewart, 6. Some other additional materials
Form of teaching	Lecture (2UoI)

	Recitation (2 UoI)
Assessment methods	Written examination (>90 min.)
Associated study programme	Physics, Chemistry B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Indusrial Engineering
Prerequisites for participation	None
Requirements for receiving credit points	Passing the examination
Grading system	The grade (100p) for the module is based on the sum of a written examination and marks gained during the semester according to the study and exam regulations. (70:30)

BEP MATH2 – Mathematics II

Module Title	Mathematics	**Module-Code**	BEP-MATH2
Workload	120 h	**Contact hours**	64 h
		Individual study	56 h
Module Coordinator	Lecturer Dr. L. Oyuntsetseg	**Language**	English

Syllabus	1. Functions, graph of polynomials, rational functions, their graph 2. Limit, derivatives 3. Derivative of polynomials, trigonometric functions, 4. Chain rule, implicit differentiation 5. Application of differentiation, analyse function by iits derivatives, graph of a function, Fourier series 6. Integrals, Area, volume, 7. Techniques of integral, substitution method, integration by parts, trigonometric integrals, rational integrals 8. Polar coordinate, parametric equations 9. Conic sections
Learning outcomes	This module will prepare students to progress to Bachelor's programs of GMIT in mathematics. The students will be given an introduction to mathematics for higher mathematics. On successful completion of this module, the students should be able to: 1. Continue higher mathematics. 2. Have some basics of analytical geometry, probability theory, linear algebra, and mathematical analysis. 3. Solve problems in analytical geometry, probability theory, linear algebra, and mathematical analysis. 4. Read and use some books in mathematics. 5. Understand in English lectures. 6. Use some problems in physics and mechanics.
Literature	1. Stewart James,RedlinLothar, Aleem Watson, Precalculus, 6th edition, 2012, 2. Calculus, Early transcendentals, 6th edition, James Stewart, 3. Some other additional materials
Form of teaching	Lecture (2UoI) Recitation (2 UoI)
Assessment methods	Written examination (>90 min.)
Associated study programme	Physics, Chemistry B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Indusrial Engineering
Prerequisites for participation	None

Requirements for receiving credit points	Passing the examination
Grading system	The grade (100p) for the module is based on the sum of a written examination and marks gained during the semester according to the study and exam regulations. (70:30)

BEP PHY1 – Physics I

Module Title	BEP Physics 01	**Module-Code**	BEP-PHY1
Workload	180h	**Contact hours**	72
		Individual study	108
Module Coordinator	N.Battulga	**Language of Instruction**	English

Syllabus	Statics: Vector operations, components, dot product, cross product, torque, Varignon's theorem, free body diagrams, equilibrium of a particle, center of gravity and centroid, strain and stress Kinematics: motion along a straight line, free fall, projectile motion, uniform circular motion, centripetal acceleration
Learning Outcomes	On successful completion of this module, the students should be able to: Statics: apply vector operations such as addition, subtraction, dot product, cross product and the principle of moments to solve simple mechanical problems, to draw complete free-body diagrams and write appropriate equilibrium equations from the free-body diagram, appreciate that deformation is caused by a force and that, in one dimension, the deformation can be tensile or compressive, describe the behaviour of springs in terms of load, extension, elastic limit, Hooke's law and the spring constant, define and use the terms stress, strain and the Young modulus Kinematics: use graphical methods to represent displacement, speed, velocity and acceleration, use the slope of a displacement-time graph to find velocity apply basic kinematic equations to solve problems of motion in one and two dimensions, express angular displacement in radians, understand and use the concept of angular velocity to solve problems, describe qualitatively motion in a curved path, and understand the centripetal acceleration in the case of uniform motion in a circle
Literature	University Physics with Modern Physics (XIII ed.) Young, Freedman Engineering Mechanics Statics (VII ed.) Meriam, Kraige Physics for Scientists and Engineers with Modern Physics (IX ed.) Servey, Jewett Fundamentals of Physics (VIII ed.) Halliday, Resnick
Form of teaching	Lecture (2 UoI) Recitation /Lab (4 UoI)
Assessment methods	Written examination (120 min) and academic performance
Associated study programme	B.Sc. Mechanical Engineering

	B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Indusrial Engineering
Prerequisites for participation	None
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%

BEP PHY2 – Physics II

Module Title	BEP Physics 02	**Module-Code**	BEP-PHY2
Workload	180h	**Contact hours**	72
		Individual study	108
Module Coordinator	N.Battulga	**Language of Instruction**	English

Syllabus	Dynamics: Newton's Laws and their applications, principle of conservation of momentum Energy and Work: Kinetic and Potential energy, Conservation of Energy Force between point charges, Electric field of a point charge, Electric potential, Capacitors and capacitance, Electric current, Potential difference, Resistance and resistivity, Sources of electromotive force, Conservation of charge and energy Oscillations and Waves: Simple harmonic motion, Energy in simple harmonic motion, waves
Learning Outcomes	On successful completion of this module, the students should be able to: Dynamics: apply Newton's laws to rigid bodies and solve problems dealing with rotation, inertia, angular momentum, conservation of linear momentum, collisions and interactions between systems Work: solve problems involving work, power, kinetic energy, potential energy, conservative and non-conservative forces and conservation of energy. Electricity: calculate the forces on charges in uniform electric fields, the electric field strength, and potential understand the function of capacitors in simple circuits and solve problems using formulae for capacitors in series and in parallel apply Ohm's and Kirchhoff's laws to electric systems and draw and interpret circuit diagrams containing sources, switches, resistors, ammeters, voltmeters Oscillations and Waves: describe simple examples of free oscillations, understand and use the terms amplitude, period, frequency, angular frequency and phase difference and express the period in terms of both frequency and angular frequency, describe the interchange between kinetic and potential energy during simple harmonic motion; show an understanding of and use the terms displacement, amplitude, phase difference, period, frequency, wavelength and speed
Literature	University Physics with Modern Physics (XIII ed.) Young, Freedman Engineering Mechanics: Dynamics, (VIII ed.) James L. Meriam, L. G. Kraige, J. N. Bolton Physics for Scientists and Engineers with Modern Physics (IX ed.) Servey, Jewett Fundamentals of Physics (VIII ed.) Halliday, Resnick
Form of teaching	Lecture (2 UoI)

	Recitation /Lab (4 UoI)
Assessment methods	Written examination (120 min) and academic performance
Associated study programme	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Indusrial Engineering
Prerequisites for participation	None
Grading system	The final grade consists of the academic performance during the module accounting for 30% and the module examination accounting for 70%

BEP CHEM1 – Chemistry /Fall/

Module Title	Chemistry	**Module-Code**	BEP-CHEM1
Workload	120 h	**Contact hours**	48 h
		Individual study	72 h
Module Coordinator	Prof. B.Battsengel	**Language**	English

Syllabus	This module will prepare students to progress to Bachelor's programs of GMIT in chemistry. The students will be given an introduction to chemistry and familiarised with the basic principles and concepts of organic, inorganic chemistry. 14. Introduction to chemistry: matters, elements, and compounds 15. Chemical element and atomic electronic structures 16. Periodic law and periodic table 17. Chemical compounds and bonds: metallic, ionic, and covalent bonds 18. Molecular shape and structure 19. Solutions and solubility 20. Fundamental laws of chemistry: the law conservation of mass, definite proportion, gases, and etc., 21. Chemical reactions and the factors to influence on chemical reactions 22. Chemical equilibria: reactions at equilibrium, Le-Chatelier's principle, and application to chemical engineering 23. Acid –base reactions 24. Redox reactions: basis, applications, and redox titration 25. Thermodynamics 26. Introduction to organic chemistry
Learning outcomes	On successful completion of this module, the students should be able to: 7. Explain basic chemical concepts and models, and analyse, interpret and apply them. Solve the general chemical problems. 8. Carry out the stoichiometric calculations. 9. Explain and apply the basic atomic structure of chemical elements and chemical bonds of molecules. 10. Describe the structure of inorganic and organic compounds 11. Acquire the knowledge of concentration types calculate the related problems 12. Apply the law of mass action to the chemical equilibrium systems. 13. Describe and solve the kinetics of chemical reactions and interpret experiments on the kinetics of reactions. 14. Apply the basic concepts of analytical chemistry in chemical analysis 15. Balance redox reactions, interpret and design electrochemical reactions. 16. Understand about the introduction to organic chemistry
Literature	Atkins, P. and Jones, L. (2013) *Chemical principles*, 6th edition. Silberberg, M. *Chemistry - Molecular Nature of Matter and Change*
Form of teaching	Lecture (2 UoI) Recitation-Lab (2 UoI- 1.25/0.75)

Assessment methods	Written examination (120 min)
Associated study programme	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering
Prerequisites for participation	None
Requirements for receiving credit points	Passing the examination
Grading system	The final grade consists of the academic performance during module accounted for 30% and the module examination accounted for 70%.

BEP CHEM-101 – Chemistry /Spring/

Module Title	Chemistry	**Module-Code**	CHEM-101
Workload	120 h	**Contact hours**	48 h
		Individual study	72 h
Module Coordinator	Prof. B.Battsengel	**Language**	English

Syllabus	This module will prepare students to progress to Bachelor's programs of GMIT in chemistry. The students will be given an introduction to chemistry and familiarised with the basic principles and concepts of organic, inorganic chemistry. 1. Redox reactions: basis, applications, and redox titration 2. Electrochemistry 3. Hydrogen and oxygen 4. s-block elements 5. p-block elements 6. d-block elements 7. Complex compounds, coordination chemistry 8. Introduction to organic chemistry: nomenclature, classification of Organic compounds, naming, structure, isomers
Learning outcomes	On successful completion of this module, the students should be able to: 1. Interpret and apply the redox equations and half-reactions 2. Identify the redox reaction in electrochemical cell and to apply and to design the galvanic and electrolytic cells 3. Explain and apply the chemical elements in the main periodic groups (alkali, earth alkali metals) 4. Explain and apply the chemical elements in the periodic groups (III, IV,V,VI,VII) p-block elements 5. Interpret the an electronic structure of complexes and naming 6. Understand the introduction to organic chemistry 7. Name and classify the organic compounds
Literature	Atkins, P. and Jones, L. (2013) *Chemical principles*, 6th edition. Silberberg, M. *Chemistry - Molecular Nature of Matter and Change*
Form of teaching	Lecture (2 UoI) Recitation (2 UoI)
Assessment methods	Written examination (120 min)
Associated study programme	B.Sc. Mechanical Engineering B.Sc. Raw Materials and Process Engineering B.Sc. Environmental Engineering B.Sc. Industrial Engineering
Prerequisites for participation	None

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

BEP INF – Informatics

Module Title	Informatics	**Module-Code**	BEP-INF
Workload	120h	**Contact hours**	64h
		Individual study	56h
Module Coordinator	Dr. Oyuntungalag	**Language of Instruction**	English, Mongolian

Syllabus	This course will teach students the skills they will need to successfully use Microsoft Excel 2013. Each lesson contains step-by-step instructions and explanations to show you how to use all the features. The course will start with basic skills, then move forward to more advanced features and techniques. An additional goal of the course is for the student to gain basic knowledge of modern-day computing technology.
Learning Outcomes	On successful completion of this module, the students should be able to: 1. Create a spreadsheet 2. Format cells, rows, columns, and entire worksheets so they fit and match your data 3. Enter data into a spreadsheet 4. Use formulas and functions for math, accounting, and totaling 5. Create formulas and functions 6. Create charts and diagrams for your data 7. Create data lists and forms 8. Use pivot tables and pivot charts 9. Print worksheet and charts 10. Share and protect your worksheets and workbooks
Literature	“Microsoft Excel 2013 Step by Step” Curtis D. Frye
Form of teaching	Lecture (2UoI) Recitation (2UoI)
Assessment methods	Module examination (written exam: 90-120 min) and academic performance (2 midterms, a final assignment, and 10-13 lab works)
Associated study programme	Basic Engineering Program (BEP)
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% and the module examination accounted for 70%.

BEP – English Level B2

Module Title	English Level B2 Basic Engineering Program	**Module-Code**	
Workload	336 hours	**Contact hours**	224 hours
		Individual study	112 hours
Module Coordinator	J. Nixon	**Language of Instruction**	English

Syllabus	**Grammar Syllabus:** present tenses, adverbs of frequency, state verbs, future tenses, conditionals types 0 to 3, the definite article, -ing/-ed participles, verbs, making deductions question tags, causative form, reported speech, wishes, would rather **Vocabulary and Topical Syllabus:** dwellings, travel, holidays, festivals, health, daily routines, shopping, advertising, sports and entertainment
Learning Outcomes	By the end of the course, participants will be able to: • successfully communicate in both oral and written forms of the language • write correctly to a large degree in more complex fields: reports, letters, descriptions, stories, articles, etc and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options, (practice all types of writing) • read a variety of authentic texts with ease • integrate students‘ reading, writing, and speaking skills to promote creative thinking and independent learning.
Literature	• Virginia Evans-Jenny Dooley, Lynda Edwards, Upstream Advanced B2, Express Publishing 2005 • Virginia Evans, Lynda Edwards, Jenny Dooley, Upstream Advanced C1, Workbook, Express Publishing 2002 • Dictionary
Form of teaching	Lecture (_____ UoI) Recitation (14 UoI)
Assessment methods	Written and oral
Associated study programme	
Prerequisites for participation	Placement test (students must have at least a low B2 level)
Grading system	Grading is based on a 100 point scale. In order to progress into a next level, students must achieve a minimum average of 60%.

	Classwork, homework, mid-term exam	**30**
	Final exam	**70**
	_____	
	TOTAL	**100**
	Attendance will be recorded. The students are only eligible to take a final examination of the module if they attend at least 80% of the contact hours of the module.	

BEP – English Level C1

Module Title	English Level C1 Basis Engineering Program	**Module-Code**	
Workload	336 hours	**Contact hours**	224 hours
		Individual study	112 hours
Module Coordinator	J. Nixon	**Language of Instruction**	English

Syllabus	**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	By the end of the course, participants will be able to: • express themselves clearly and talk about complex facts in a structured and detailed way • use the language efficiently and flexibly in their social and professional lives as well as in their studies. • write correctly to a large degree in more complex fields • understand any kind of spoken language, live or broadcast, at fast native speed • read with ease abstract, structurally or linguistically complex texts • integrate their reading, writing, and speaking skills to promote creative thinking and independent learning.
Literature	• Virginia Evans-Jenny Dooley, Lynda Edwards, Upstream Advanced C1, Express Publishing 2005 • Virginia Evans, Lynda Edwards, Jenny Dooley, Upstream Advanced C1, Workbook, Express Publishing 2005 • Dictionary
Form of teaching	Lecture (_____ UoI) Recitation (14 UoI)
Assessment methods	Written and oral
Associated study programme	BEP

Prerequisites for participation	Participants must have successfully completed level B2 or have a comparable knowledge of English
Grading system	Grading is based on a 100 point scale. In order to progress into a next level, students must achieve a minimum average of 60%. Classwork, Homework, Midterm exam **30** Final Exam **70** _____ **TOTAL** **100** Attendance will be recorded. The students are only eligible to take a final examination of the module if they attended at least 80% of the contact hours of the module