[PS]Designing and Implementing Applied Geosciences Bachelor and Master Programs Tailored for the Gulf Region*

Wilfried Bauer[1], Michaela Bernecker[1], Bernhard Heim[2], Ekkehard Holzbecher[1], and Wiekert Visser[1]

Search and Discovery Article #70223 (2016)**
Posted September 19, 2016

*Adapted from poster presentation given at AAPG GEO 2016, The 12th Middle East Geosciences Conference and Exhibition March 7-10, 2016, Manama, Bahrain
**Datapages © 2016 Serial rights given by author. For all other rights contact author directly.

[1]Applied Geosciences, German University of Technology in Oman, Athaibah, Muscat, Oman (wilfried.bauer@gutech.edu.om)
[2]Science, German University of Technology in Oman, Muscat, Oman

Abstract

The Bachelor of Science in Applied Geosciences degree is offered by GUtech since 2007. The program was created by the RWTH Aachen University, a German institution with over 140 years of experience in education in the fields of engineering and natural sciences. The curriculum of the BSc program focuses on three topics which are of key importance for the future in the Gulf Region: hydrocarbons, water, and mineral resources. Elements of the program have been set up after a review of the industry's needs.

Students benefit from the input of new scientific ideas and teaching concepts developed by GUtech professors and applications contributed by RWTH Aachen. The "Kaizen" learning methodology, a teaching philosophy based on a mix of short learning units and repetitions with feedback loops and tests is used to continuously calibrate a course to student's needs. This blended, student-centred learning technique was analysed regarding its direct impact on the students' performance. The case study in Oman from GUtech leads to easy-to-implement key drivers for successfully teaching science. A newly designed Integrated Master Program for Applied Geosciences is based on the experiences from an existing Master Program for Petroleum Sciences that is running since 2010. The new integrated MSc program which is scheduled to start in 2016, will be composed of four parts: a core program followed by elective courses, focused on the three topics: water, petroleum and mineral resources. Advanced courses in geophysics, geochemistry and modeling in the specific domains will deepen the knowledge and enable the graduates either to start an academic career or take senior positions in ministries, companies and research institutions.

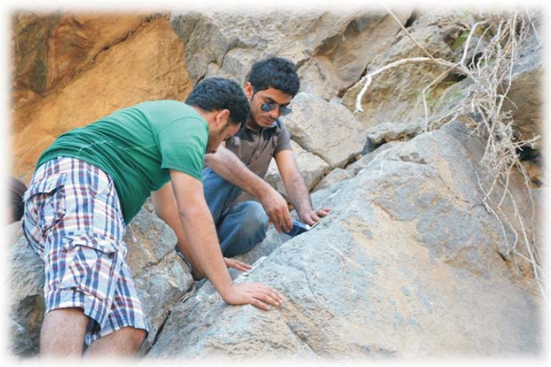
The basic courses are taught by GUtech professors according to German standards with significant teaching and research experience, publication record and industry experience. Specialized technical courses are taken over by drive-ins from industry and International fly-in professors. The structure and organization of the MSc Program is tailored for the region following German quality requirements. The integrated and interdisciplinary MSc program will be open to graduates with BSc degrees in Geosciences, Physics, Petroleum Engineering or Environmental Sciences. It is planned to run the Master Program fulltime (1.5 years) and part-time (3 years), if required by market demand, allowing graduates already employed by the industry to study for a post-graduate degree.

Designing and Implementing Applied Geosciences Bachelor and Master Programs Tailored for the Gulf Region

Wilfried Bauer, Michaela Bernecker, Bernhard Heim, Ekkehard Holzbecher and Wiekert Visser
German University of Technology in Oman, PO Box 1816, 130 Athaibah, Sultanate of Oman

The University

The German University of Technology in Oman (GUtech) is a private university based in Muscat. GUtech was established in 2007 in collaboration with RWTH Aachen University in Germany, one of the leading universities of technology in Europe.
In summer term 2012 the first students were graduated. Currently about 140 students are enrolled in the Bsc program for Applied Geoscience.
The overall objective is to provide an excellent holistic education modelled after RWTH Aachen University's principles. GUtech will provide well-trained graduates to Oman's and the wider region's industry.

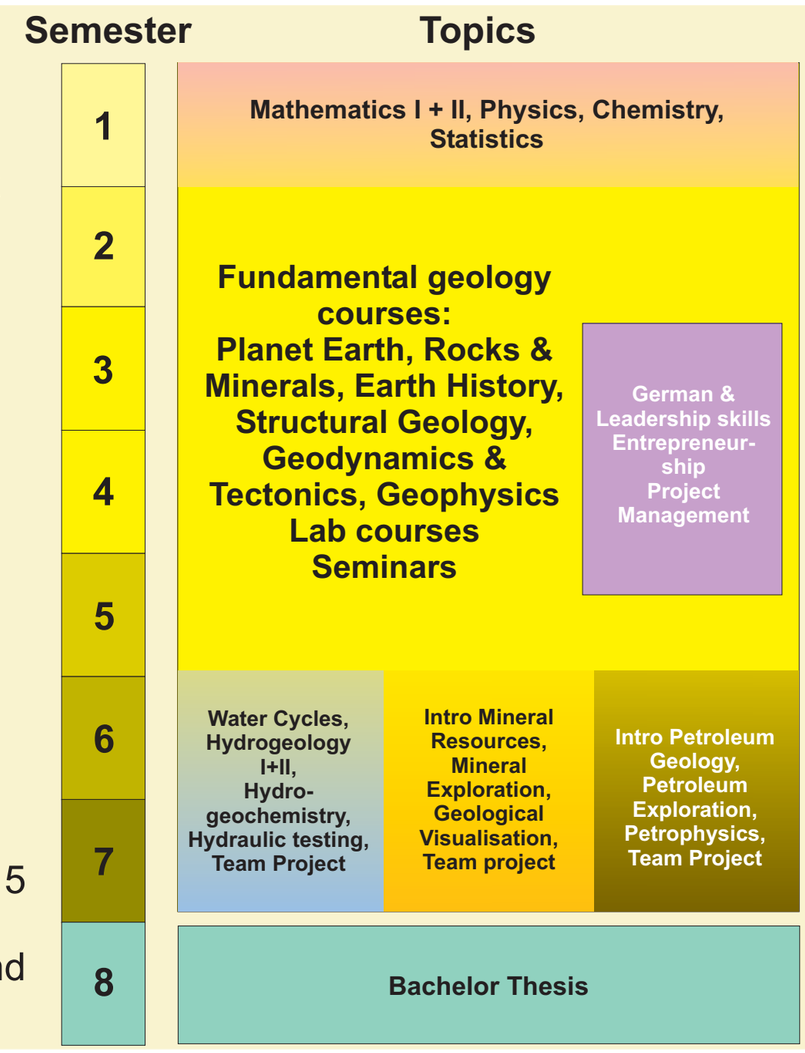


Field Geology
Cornerstone of Geoscientific Education, identification of rock types, reading of geological maps, using instruments like compass, GPS.
- Three excursions of 5 days each, one of them outside Oman
- 15-20 days in courses Geological Field Methods, Geological Mapping and Quantitative Field Methods

Laboratory Courses
Enhancement of practical skills and an insight into the professional work as a geoscientist
- Chemistry
- Geoscientific laboratory course (sedimentological and petrographical methods)
- Courses in 2D and 3D visualization of geological results
- Courses abroad in internationally reknown research institutions

The Bachelor program

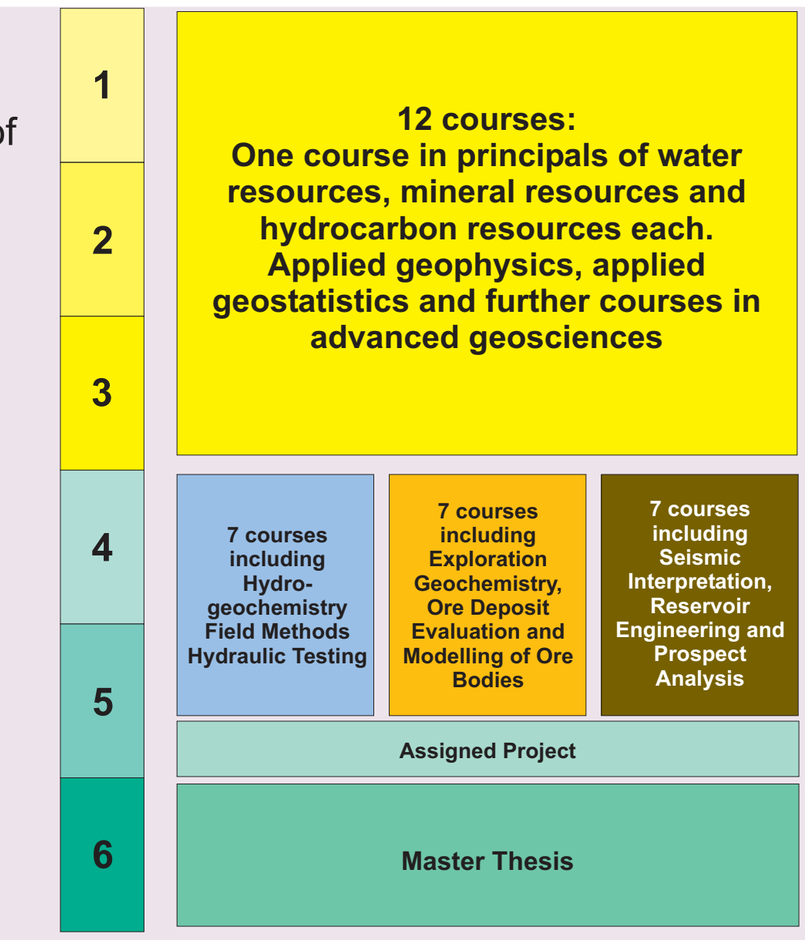
- 4-years full-time program
- In total 56 courses, one Team project and the final Thesis
- 90% taught by Oman-based professors, 10% by fly-in professors
- Set up by geologists from Aachen University
- First year strong focus on general sciences
- Last year focus on the three applied subjects:
  - **Hydrogeology**
  - **Petroleum geology**
  - **Mineral resources**
- Carreer oriented programme with focus on ethical, critical and creative thinking
- ACQUIN accreditation granted in 2015
- Curriculum matches “Applied Professional” standards by Drummond & Markin (2008)



The Master program*

- First three semesters fundamentals of advanced and applied geosciences
- Strong focus on applied geophysics
- Insight in neighboring geoscience disciplines provided
- Second part of the studies focus on one of the three electives:
  - **Hydrogeology**
  - **Petroleum Geology**
  - **Mineral Resources**
- Practical activities outside the University and assigned projects in collaboration with International research institutions broaden the experience and prepare the students careers either in the industry or academia

* Ministerial approval pending



Teaching Techniques: Kaizen and E-Learning

The art of teaching freshmen students is undergoing a rapid paradigm change. New multimedia tools and concepts are offered and students are dealing with mobile devices on a daily base for private and education purposes. We decided to use these available technical tools and combine with the skills of the students to implement a new teaching concept. Kaizen learning is based on a mix of short learning units with feedback loops and tests and repetitions. The repetitions are based on identified knowledge gaps which allows an ongoing calibration of the content of individual lectures (Heim et al. 2014). Mobile devices with specifically designed apps support this approach. This balanced traditional teaching and E-learning concept has been sucessfully implemented in freshman courses such as mathematics and chemistry for first-year geoscience students.

References
Drummond, C.N. & Markin, J.M. 2008. An analysis of the Bachelor of Science in Geology Degree as offered in the United States. J. Geoscience Education 56, 113-119
Heim, B, Rupp, F., Viet, N., von Stockhausen, P., Gallenkämper, J. & Kreuzer, J. 2014. Driving student-centred calculus: results of a comprehensive case study for Kaizen learning in the Sultanate of Oman. Int. J. Math. Education Sci. Techn. Doi 10.1080/0020739X.2014.979897

Contact:
michaela.bernecker@gutech.edu.om (Bachelor coordinator)
wilfried.bauer@gutech.edu.om (Master coordinator)