Inhalte der Lehrveranstaltungen im Master-Studium

Abkürzungen: V = Vorlesung (Zahlen sind Stunden pro Woche)
S = Seminar
U = Übungen
ECTS = European Credit Transfer System

Module 1: Communication

Leadership & Negotiation Skills. (V-U:2-0) compact. ECTS 3,8.
Job coaching; interpersonal team skills profile; shaping up; high performance teams; virtual leader; coming to terms; managing change.
Prerequisite:

Interpersonal Skills. (V-U:2-0). ECTS 3,8.
Understanding yourself; building trust; developing successful interactions; creating learning conversations.
Prerequisite:

Basic Geoinformation Systems. (V-U:2-1). ECTS 4,5
Basic surveying; position measurement; error determination; levelling; goniometry; tacheometry; cartography; special surveying.
Prerequisite:

Objectives; principle structure of controls; dynamic systems; linearizing around a steady state; stability of dynamic systems; linear time-invariant systems; linear time-invariant control.
Prerequisite:

Technical English. (V-U:0-2). ECTS 1,4.

Module 2: Data Acquisition and Evaluation

Applied Well Test Analysis. (V-U:2-1) compact. ECTS 4,5.
Targets for well testing; downhole & surface equipment; well test principles; reservoir models; single & multi well test analysis; gas well test analysis; interpretation methodology.
Prerequisite: Approval of Graduate Adviser.

Well Logging II. (V-U:2-0). ECTS 3,8.
Cement bond; porosity & saturation; identification of by-passed oil & gas; corrosion monitoring; production logging; mono- & multiphase analysis; horizontal well analysis.
Prerequisite: Approval of Graduate Adviser.

Applied Seismic Interpretation. (V-U:2-1). ECTS 4,5.
Impact of geology on propagation of seismic waves, reflection & refraction; interpretation techniques for 2-D & 3-D seismic data; seismic structure: seismic sequencies and facies; seismic attributes; plays & prospects.
Prerequisite: Approval of Graduate Adviser.
Advanced Geostatistics.(V-U:3-0) teleteaching.ECTS 4,5.
Univariate analysis; measures of heterogeneity; hypothesis tests; bivariate analysis; analysis of spatial relationships; use of statistics in reservoir modeling.
Prerequisite:

Rock Mechanics II.(V-U:2-1).ECTS 4,5.
Hydromechanical analysis of completed wells; perforation mechanics; sand production prediction; theory of hydraulic fracturing; depletion and compaction; subsidence.
Prerequisite: Approval of Graduate Adviser.

Petrophysics I.(V-U:2-1).ECTS 4,5.
Development & general use of petrophysics; pore characteristics; density; magnetic.
Prerequisite: Approval of Graduate Adviser.

Module 3: Reservoir and Fluid Mechanics

Basics of thermodynamics; physical properties of real gases, gaseous & liquid systems; chemistry & properties of organic components; two-phase systems; numerical treatment of real systems; chemistry of brines, equilibria with water phases; interfacial energy.
Prerequisite:

Improved Oil Recovery.(V-U:2-0).ECTS 3,8.
Basics of water flooding; selection criteria for enhanced recovery processes; chemical flooding; gas flooding; steam flooding; well treatment.
Prerequisite: Approval of Graduate Adviser.

Gas flow in porous media; enhanced recovery by waste gas flooding; unconventional gas reservoirs; multiple fracture stimulation; halite precipitation and prevention.
Prerequisite: Approval of Graduate Adviser.

Natural Gas Storage in Porous Media.(V-U:2-0) compact.ECTS 3,8.
Storage types; gas reservoirs; well design, completion & surface installations; aquifer storages; injection/production simulation; injection production problems.
Prerequisite: Approval of Graduate Adviser.

Natural Gas Storage in Rock Caverns.(V-U:2-0).ECTS 3,8.
Media for storage; operating principles; storage in salt caverns; development & operating fundamentals; storage in mined caverns.
Prerequisite: Approval of Graduate Adviser.

Module 4: Reservoir Modeling and Simulation

Architecture of reservoir rocks; type, principles & database of digital geologic models; seismic interpretation principles; principles of model construction.
Prerequisite: Approval of Graduate Adviser.

Numerical Reservoir Simulation.(V-U:2-1).ECTS 4,5.
Reservoir heterogeneities; data acquisition & analysis; upscaling of flow
simulations; model construction; finite difference methods; black oil formulation; numerical solutions; special options for reservoir simulations.  
*Prerequisite:* Approval of Graduate Adviser.

**Reservoir Model Validation.(V-U:2-0).ECTS 3,8.**
Model validation & benchmarking; history matching - inverse problem statement; local & global optimization methods; application of optimization techniques; uncertainty analysis & model prediction.  
*Prerequisite:* Numerical Reservoir Simulation.

**Fractured Reservoir Modeling.(V-U:2-0).ECTS 3,8.**
Deformation of reservoir rocks, tectonic styles; classification of fractures, sources of information mapping of trends; fracture properties.  
*Prerequisite:* Geological Modeling.

**Advanced Reservoir Topics.(S-U:2-0).ECTS 3,8.**
Case studies, special projects and applications presented by industry experts and students.  
*Prerequisite:* Module 2/3.

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**Module 5: Drilling Engineering**

**Well Planning.(V-U:2-1).ECTS 4,5.**
Well planning fundamentals; formations & formations pore pressure, frac gradient; trajectory planning; design of drill string, casing, cementing and completion; drilling and completion cost and optimization, blow out prevention.  
*Prerequisite:* Approval of Graduate Adviser.

**Advanced Drilling Technology.(V-U:2-1).ECTS 4,5.**
Drilling concepts, well design procedure, drilling performance and analysis, drill string dynamics, drilling problems, hp/ht/horizontal/extended reach/multilateral wells, under balanced drilling, offshore drilling.  
*Prerequisite:* Approval of Graduate Adviser.

**Directional Drilling.(V-U:2-0).ECTS 4.**
Directional well planning & design, downhole motors, directional survey methods, measurement/logging while drilling, gesteering, bottom hole assemblies, economic aspects.  
*Prerequisite:* Approval of Graduate Adviser.

**Advanced Drilling & Production Topics.(V-U:2-0).ECTS 4.**
Case studies, special projects and applications presented by industry experts and students.  
*Prerequisite:* Module M5/M6.

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**Module 6: Production Engineering**

**Completion & Workover.(V-U:2-1).ECTS 4,5.**
Completion: mechanical aspects of well testing; perforation & completion; tubing string design; packers & downhole tools; flow control; intelligent completion & data acquisition; workover: rigs, tools & equipment; completion & workover design.  
*Prerequisite:* Approval of Graduate Adviser.

**Advanced Petroleum Production.(V-U:2-1).ECTS 4,5.**
Well deliverability; well design considerations; artificial lift design; improved oil
recovery design; problem well analysis; treatment design, gathering, metering & design; production optimization using nodal analysis. 

Prerequisite: Approval of Graduate Adviser.

**Stimulation Technology.(V-U:1-1).ECTS 2,6.**
Formation damage & removal; matrix acidization; hydraulic fracturing for well stimulation; design, execution & performance evaluation of hydraulic fracturing; scale deposition & removal; sand production & control. 

Prerequisite: Approval of Graduate Adviser.

**Advanced HC Conditioning & Processing.(V-U:2-0) compact. ECTS 3,8.**
Oil & gas processing & equipment; process simulation; separation & oil treating facilities; heat transfer and facilities; pumps, compressors & drivers; design of natural gas dehydration systems; sour gas processing & sulphur recovery; operations & maintance; safety, environment & human factors in design & operations.

Prerequisite: Approval of Graduate Adviser.

Module 7: Drilling/Production Supplementary Courses

**Well Logging II/Rock Mechanics II.**
See Module Data Acquisition and Evaluation.

**Materials Engineering & Corrosion.(V-U:2-0).ECTS 3,8.**
Petroleum fluids, materials & corrosion; material selection; corrosion inhibition; hydrogen corrosion; corrosion testing; other protection measures. 

Prerequisite: Approval of Graduate Adviser.

**Offshore Production & Structures.(V-U:2-0).ECTS 3,8.**
Design elements, ocean floor surveying & platform foundation; design of fixed floating platform systems; subsea completions; logistics & offshore pipelines. 

Prerequisite: Approval of Graduate Adviser.

Module 8: Natural Gas Transport and Logistics

**Natural Gas Transport & Distribution I.(V-U:2-1).ECTS 4,5.**
Design of low pressure grids; gas metering; analysis of gas flow in extended grids; technical regulations & standards; economics; construction & commissioning; pressure regulation; in-house installation. 

Prerequisite: Approval of Graduate Adviser.

**Natural Gas Transport & Distribution II.(V-U:2-0).ECTS 3,8.**
Design of high pressure pipelines; design of compressor stations; high pressure regulation; high pressure metering; pipeflow under high pressure conditions; quality blending; pipe storage; sensors & data transmission; corrosion & protection; economic construction & commissioning. 

Prerequisite: Approval of Graduate Adviser.

**Operations of NG Transportation Networks.(V-U:2-0).ECTS 3,8.**
Legal requirements & standards; organization of operations; maintance; quality management; health; safety & environment; operating cost; reporting; options for cost reduction; third party service. 

Prerequisite: Approval of Graduate Adviser.

**Natural Gas Dispatching & Logistics.(V-U:2-1).ECTS 4,5.**
Demand forecasting, nomination, disposition & commercial balancing of networks; network access models; network services & tariffs; supply point management & load profiles; TPA process; network control & supervision.

**Prerequisite:** Approval of Graduate Adviser.

### Module 9: Natural Gas Storage

**Advanced Natural Gas Production.** (V-U:2-1).ECTS 4.5.
Inflow performance; vertical lift performance; flow in gathering systems; production forecasting; compression; liquid unloading; hydrates; optimization using nodal analysis.

**Prerequisite:** Approval of Graduate Adviser.

**Advanced HC Conditioning & Processing.**
See Module Production Engineering.

**Natural Gas Storage in Porous Media/Natural Gas Storage in Rock Caverns.**
See Module Reservoir and Fluid Mechanics.

### Module 10: Transport/Storage Supplementary Courses

**Natural Gas Utilization.** (V-U:2-0).ECTS 3.8.
Combustion & burner technology; residential, commercial & industrial applications; residential & industrial pipe work; gas-turbines, co-generation, heat pump; natural gas vehicles; safety standards & code requirements.

**Prerequisite:** Approval of Graduate Adviser.

**Advanced Transport & Storage Topics.** (S-U:0-2).ECTS 3.8.
Case studies, special projects and applications presented by industry experts and students.

**Prerequisite:** Module M8/M9.

**Thermodynamics Gas Turbines & Compressors.** (V-U:2-0) teleteaching.ECTS 3.8.
Thermodynamics and design of gas turbines; thermodynamics & design of compressors; operating issues.

**Prerequisite:** Approval of Graduate Adviser.

**Well Logging II/Rock Mechanics II.**
See Module Data Acquisition and Evaluation.

**Materials Engineering and Corrosions.**
See Module Drilling/Production Supplementary Courses.

### Module 11: Management, Economics and Law

**Oil & Gas Contracts.** (V-U:1-0).ECTS 1.9.
Energy laws; contracts for exploration & production (royalty tax, PSA, service agreements); oil & gas contracts (processing, transportation, sales).

**Prerequisite:**

**Planning & Budgeting.** (V-U:1-1).ECTS 2.6.
Planning fundamentals; vertical, horizontal & mixed type of business; types of investment; evaluation of investment opportunities; investment portfolio; from portfolio to budget proposal; capital budget & decision; operational budget &
realization; strategic investment plan; follow-up & controlling.

Prerequisite:

Business environment & direction; portfolio & business plan; processes & procedures; assets & activities; performance measurement; business improvement; cost management; health, safety & environment management; change management.

Prerequisite:

Reservoir Management.(V-U:2-0).ECTS 3,8.
Reservoir management & economics; data acquisition & validation; data integration; gas/oil reservoir performance calculations; well & facilities calculations; documentation, implementation & monitoring; case studies. This is intended to prepare for the group project.

Prerequisite:

Cost structure of gas transmission systems; economic analysis of alternatives to drive compressors; TPA versus construction of own pipeline; contracts; transportation, distribution & storage market; portfolio management; hubs & market centers; marketing concepts.

Prerequisite:

Legal framework for energy industry, in particular the laws governing third party access, energy supply contracts & approval of facilities for energy supply.

Prerequisite:

Energy Management.
In Preparation, offered 2005.

Energy Markets.
In Preparation, offered 2005.

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