Geothermal Training in Oradea, Romania

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Abstract

The paper presents the International Geothermal Training Centre at the University of Oradea, Romania, the offered specialisations and their respective curricula, admission requirements and tuition fees, as well as the location and services offered by the training centre.

Keywords: geothermal training, higher education

1. Background

The University of Oradea is a state university established with this name in 1990, based on other higher education institutions, which functioned, under different names, for more than a century before. It has at present about 2,000 employees, about 30,000 undergraduate, graduate and postgraduate students in 18 faculties and 4 colleges, and a number of entities (groups, teams, centres) active in some specific research fields.

The University of Oradea has a 20 years experience in geothermal research and a 5 years experience in specialised geothermal high-level training. Its departments related to geothermal training and research are: the National Geothermal Research Centre, the International Geothermal Training Centre, and mainly the Faculty of Energy Engineering, which offers B.Sc. training in Renewable Energy Resources and M.Sc. training in Geothermal and Solar Energy Utilisation. Other faculties also have, among their activities, training and/or research addressing different topics related to geothermal resources and their utilisation, such as the Faculty of Electrotechnics and Informatics, the Faculty of Environment Protection, and the Faculty of Medical Sciences.

Many EU Member and Associated States, as well as other countries, more or less close to Europe, have significant geothermal resources (mainly low enthalpy), suitable for both direct heat utilisation and power generation. Properly implemented, geothermal energy is sustainable, most of it renewable, and benign for the environment. Although its advantages are well known, the present geothermal production stands far below the expectation allowed by the assessed potential, mainly in the Associated, but also in some Member States. One reason for this situation is the limited number of available specialists with the multi-disciplinary training required by the exploitation and utilisation of geothermal resources.

In the economic environment prevailing in most European states, the profitability of geothermal projects is rather limited, and requires carefully selected cost-effective technical solutions, some of them known by experienced specialists, other still waiting to be discovered or improved. Therefore, on the job training is difficult, although it seems to still be the most common way to train new specialists in many countries.

2. The International Geothermal Training Centre

Taking into consideration the present and especially the forthcoming demand of specialists in the field of exploitation and use of geothermal resources, both in Romania and in other Central and East European countries, the University of Oradea decided to create an international centre for geothermal instruction (The International Geothermal Training Centre). This centre offers specialized training on several levels and for various lengths of time, in accordance with the candidates' demands and potential requirements. Instruction is offered by members of the University of Oradea academic staff, as well as by well-known Romanian and foreign professors and specialists, invited based on the recommendation of the International Geothermal Association (I.G.A) and its European Branch.

The official inauguration of the Centre took place in April 1997, at the International Seminar for Geothermal Instruction, an event organized under the auspices of the International Geothermal Association in conjunction with the 25th meeting of its Board of Directors.

The mission of the International Geothermal Training Centre, as stated by Dr. Ingvar B. Fridleifsson (Director of the United Nations University Geothermal Training Programme in Reykjavik, Iceland, and President of the IGA at the time), is to pursue the establishment of an organized skill-training and skill-improvement system for developing the labour force needed within the context of growth of geothermal as an alternative energy source in Central and East Europe.

3. Programs Offered by the International Geothermal Training Centre

Considering the previously identified needs, training is offered in five specializations, at different levels of education, and being addressed to different types of trainees, as follows:

No.	Specialization	Program duration (weeks)	To whom it is addressed	Level of education	Period
1.	Energy Engineering of Geothermal Resources	28	Experts, Consultants, Researchers, Designers	In-depth studies (M.Sc.)	Oct - July
2.	SCADA operators	2	Technicians and Operators	Intermediate	Sept - Oct; June - July
3.	Management of Geothermal Systems	1	Management and Decision-taking personnel in Administrative, Legislative, and Economic sectors	Post-Graduate	Sept - Oct; June - July
4.	Automation of Geothermal Heating Systems	6	Engineers, Designers and Specialists in Exploitation	Post-Graduate	Sept - Oct, June - July
5.	Exploitation of Geothermal Reservoirs	6	Engineers, Designers and Specialists in Exploitation	Post-Graduate	Sept - Oct, June - July

4. Curricula of the Available Programs

4.1. SPECIALISATION: Energy Engineering of Geothermal Resources

LEVEL: In-depth studies. Master of Sciences (M.Sc.)

LENGTH: 1 year

Admission requirements: University degree (5 years) B.Sc. in Energy Engineering, Thermal Engineering, Hydraulic Machines, Installations, Reservoir Engineering, or Well Drilling and Exploitation.

Graduation: Defending a dissertation

Certification: Diploma of Graduation (M.Sc.)

Teaching and Examination Language: English (on request, Romanian translation)

CURRICULUM

No	Subject	1st Semester				2nd Semester				Evalu-ation	Hours/yr.	
		L	**S**	**Lab**	**Pr**	**L**	**S**	**Lab**	**Pr**		**L**	**PA**
1.	Identification and assessment of geothermal resources	4	2	4	-					Ex	56	56
2.	Utilization of geothermal energy and fluids	4	-	2	4					Ex+Pr	56	84
3.	Automatic control of geothermal systems	4	-	4	-					Ex	56	56
4.	Management of geothermal reservoirs					4	4	-	-	Ex	56	56
5.	Feasibility assessment of geothermal projects					4	-	-	4	Ex+Pr	56	56
6.	Modelling geothermal heating systems					4	2	4	-	Ex	56	84
	TOTAL	12	2	8	4	12	6	4	4			

Explanations:

L = lecture; S = seminar; Lab = laboratory; Pr = project; Ex = exam; PA = practical activities; all in hours per week.

4.2. SPECIALISATION: SCADA Operators

LEVEL: Intermediate

Admission requirements: Post-secondary technical studies

Certification: Graduation Certificate

Teaching Language: English (on request, Romanian translation)

Length: 2 weeks

CURRICULUM

1. Hands-on training on utilisation of Supervisory Control and Automatic Data Acquisition systems (SCADA):
   - 80 hr. hands-on training
   - evaluation test

4.3. SPECIALISATION: Management of Geothermal Systems

LEVEL: Post Graduate

Admission requirements: Management personnel

Certification: Participation Certificate

Teaching Language: English (on request, Romanian translation)

Length: 1 week

CURRICULUM

1. Particularities of geothermal energy management: 20 hour lectures (3 days)
2. Feasibility assessment of geothermal projects: 20 hour hands-on training (3 days)
3. Technical visits: 10 hours (1 day - Sunday)

Total: 50 hours (one full week)

4.4. SPECIALISATION: Automation of Geothermal Heating Systems

LEVEL: Post Graduate

Admission requirements: Technical university studies min. 5 yr. (B.Sc.)

Certification: Certificate of Graduation

Teaching Language: English (on request, Romanian translation)

Length: 6 weeks

CURRICULUM

1. Influence of exploitation parameters on geothermal energy utilization possibilities (1 week)
   - 32 hr. lectures
   - 8 hr. seminar
   - evaluation test

2. Specific equipment for geothermal energy exploitation and utilisation (1 week)
   - 32 hr. lectures
   - 8 hr. laboratory

3. The **"In Touch"** programming environment (2 weeks)
   - 80 hr. hands-on training
   - evaluation test

4. Heating systems simulation by **"ACSL"** and/or **"HeatMap"** (2 weeks)
   - 80 hr. hands-on training
   - evaluation test

4.5. SPECIALISATION: Exploitation of Geothermal Reservoirs

LEVEL: Post Graduate

Admission requirements: University studies min. 5 yr. (B.Sc.) in Geology, Geophysics, Oil and Gas (Reservoir Engineering, Drilling and Well Exploitation)

Certification: Graduation certificate

Teaching Language: English (on request, Romanian translation)

Length: 6 weeks

CURRICULUM

1. Identification and evaluation of geothermal resources (3 weeks)
   - 96 hr. lectures
   - 24 hr. laboratory
   - evaluation test

2. Management of geothermal reservoirs (1 week)
   - 32 hrs. lectures
   - 8 hr. seminar
   - evaluation test

3. Feasibility assessment of geothermal projects (2 weeks)
   - 56 hr. lectures
   - 24 hr. seminar
   - evaluation test

5. Admission requirements

The International Geothermal Training Centre students shall mainly come from Central and East European countries that have developed projects for the utilization of geothermal resources but are facing a shortage of trained workers.

The number of students who can register for these programs depends on the number of places designated by the University Senate.

Candidates must have a university degree in engineering, minimum one year geothermal experience, working knowledge in English, and be permanently employed by a specific institution.

The admission procedure requires an application and proof of fulfilment of all the requirements needed for taking the program:

- proof of previous studies required for attendance in the desired training program;
- payment of tuition fees;
- working knowledge in English.

This is followed by an interview that is intended towards the selection of students with interest, knowledge, and development potential in the field.

In case where requests overrun available enrolment places, an admission exam may be organized. The admission tests are in close link with the pursued specialization, being set by the University Senate. Examination shall be in writing.

6. Fees

Fees were set by the University Senate taking in consideration the economic resources of the countries in the region, and they were differentiated according to the complexity and duration of the program. The fees are in the amounts of:

- 100 USD/student, for short-term programs
- 200 USD/student, for medium term programs
- 400 USD/student, for in-depth programs

The value of these fees may be periodically changed by the decision of the University Senate.

7. Location

The International Geothermal Training Centre operates within the University of Oradea. The settings of the Centre are, therefore, those of the University's (details on the web site).

The Centre shall be able to use a classroom for collective classes and 5 smaller capacity rooms for specialization classes. For the hands-on activities, it shall use the lab facilities of the Faculty of Energy Engineering, Electrical Engineering, Mechanical Engineering, Environment Protection, or those of the National Geothermal Research Centre.

We mention that, at the University and in the Bihor County, there are numerous practical applications in geothermal energy use, which constitute real-life study objects.

We mention some examples:

- the geothermal system at the university campus, which comprises: a geothermal production well, well station, storage tank, circulation pumps, heat exchangers station, pilot binary cycle power plant, control room for SCADA system;
- the Nufarul doublet in Oradea;
- the greenhouses in Bors;
- space heating in Oradea, Beius, and Cighid;
- the Felix Spa balneal resort.

8. Services offered by the training centre

The administration of the International Geothermal Training Centre will offer the students the following services:

- accommodation during program attendance (low fee);
- transportation from and to the accommodation place;
- meals at the University's canteen (low fee);
- photocopy of certain materials requested by students and lecturers;
- access to phone and fax;
- visit of tourist sites in the area.

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