UNIVERSITY OF ICELAND

**Faculty of Industrial Engineering,
Mechanical Engineering and Computer Science**

**SCHOOL OF ENGINEERING
AND NATURAL SCIENCES**

SELF-REVIEW REPORT

June 2019

UNIVERSITY OF ICELAND

Introduction

In accordance with the Icelandic Quality Enhancement Framework at the University level in Iceland and the University of Iceland's Guidelines for the organization, schedule and process of institution-led review of faculties and interdisciplinary programs, the Faculty of Industrial Engineering, Mechanical Engineering and Computer Science (the Faculty), School of Engineering and Natural Sciences (the School), University of Iceland (the University), carried out self-evaluation in February 2019. The results are presented in this report. A self-evaluation committee was established in January 2019.

The committee members were:

1. Rúnar Unnþórsson, Professor and Head of Faculty. Chair of committee.
2. Guðmundur Valur Oddsson, Professor, Head of Department of Industrial Engineering
3. Halldór Pálsson, Professor, Head of Department of Mechanical Engineering
4. Steinn Guðmundsson, Associate Professor, Head of Department of Computer Science
5. Helmut Wolfram Neukirchen, Professor, Vice Head of Faculty
6. Þórður Jónsson, representative of undergraduate students
7. Ásdís Erla Jóhannsdóttir, representative of undergraduate students
8. Sigurður Gauti Samúelsson, representative of graduate students
9. Ingunn Guðbrandsdóttir, representative of graduate students
10. Björn Sighvatsson, representative of former students, industry or society,
11. Hafrún Sjöfn Harðardóttir, representative of former students, industry or society,
12. Guðný Benediktsdóttir, project manager, assisted the committee

The self-evaluation process started in January 2019 with establishing the committee and subsequent meetings with Áslaug Helgadóttir, the Director of Quality Management, and personnel at the Centre for Teaching and Learning. The Centre aided in the revision of learning outcomes. In February the Faculty members of the committee and student representatives met with the employees of the Social Science Research Institute to prepare for interviews with focus groups. The Institute provided both results from their annual surveys and their meetings with the focus groups.

The committee wrote the report, evaluated the collected data, discussed the strengths and weaknesses of the study programs and research and suggested relevant actions for enhancement.

Three external reviewers reviewed the report, visited the Faculty and met with students. The three external reviewers were Polat Gülkan, Professor Emeritus of Civil Engineering at Middle East Technical University (Turkey), Rajeev Bansal, Professor of Electrical Engineering at University of Connecticut (USA) and Aletta Nylén, Assistant Professor in Computer Science at Uppsala University (Sweden).

Faculty Characteristics

The Faculty was formed as an independent faculty on July 1st, 2008 when the University was restructured. The new faculty was a merger of the former Department of Mechanical and Industrial Engineering and Department of Computer Science. The Faculty is the largest among the faculties within the School of Engineering and Natural Sciences in student numbers, currently with 758 BS students and 98 graduate students which is close to the average over the last four years (782 BS students and 97.4 BS/PhD students).

The management of the Faculty is in the hands of the Faculty meeting, Head of Faculty and the Dean of the School.

Professor Rúnar Unnþórsson has been Head of Faculty since July 2018. The Head is elected for two years at a Faculty meeting. The Head of Faculty is responsible for the professional leadership of the Faculty and, with the Dean of the School, for developing its policy, coordinating study programmes, the quality of teaching and research, communication with collaborating partners, and for ensuring that the Faculty keeps within the financial limits of the School. The Head of the Faculty is a member of the Board of the School (see the definition of the Faculty's role in the University's regulations - https://english.hi.is/node/18642#16).

For the last few years, Faculty meetings have been held approximately once each semester. All professors, associate professors, assistant professors, adjunct teachers and student representatives are required to attend the Faculty Meetings. The purpose of the meetings is to discuss major issues concerning the Faculty and decide upon them. For the last years, only undergraduate students have been represented at these meetings since, unfortunately, the association of the graduate students has been inactive.

The Faculty is divided into three departments currently headed by :

- Professor Halldór Pálsson, Mechanical Engineering
- Professor Guðmundur Valur Oddsson, Industrial Engineering
- Senior Lecturer, Steinn Guðmundsson, Computer Science

The department heads are elected for two years at department meetings. The department heads oversee departmental operations and supervise the work of study committees, teaching methods and other matters concerning teaching.

Summary and Main Conclusions for the Faculty

Lessons learned from QEF1

The Faculty has been working on the important concerns identified in QEF1. However, the work has not progressed as rapidly as was anticipated. In fact, although small adjustments have been made since 2014, all the identified concerns are still valid.

The self-review team believes that the main lesson from the QEF1 is that the ambitions and scope of the action items listed in the self-review report were too high and wide to be finished within the given time frame. Actions have been taken to address all the concerns, but the work is not finished. The following are four examples of concerns identified in QEF1 and the actions taken by the Faculty:

Concern: Written and oral presentation skills are lacking among BS students.

Action A new mandatory course called "Introduction to Engineering" was introduced in the fall of 2015. Part of the course's objectives was to train students in group work and technical communication. The students that finished the course were able to effectively communicate challenges and engineering solutions verbally, in writing and visually.

Concern: The BS study programs need revision.

Action Since QEF1 there has been a lot of work carried out on restructuring the BS programmes – the Department of Industrial Engineering has led the work in collaboration with industry, current students and graduated students. The new programme will be available in the school year 2019-2020.

Concern: MS students are lacking both written and oral presentation skills.

Action The Faculty has put quite a lot of effort into analysing this concern and in the Department of Industrial Engineering, a new mandatory course addressing the listed concern was introduced in the fall of 2017. The course is called "Introduction to master's studies in Industrial Engineering". The students that finish the course can present, in cooperation with other students, the background of a research project, research questions, methodology, results and conclusions, both orally and in writing. In addition, the Faculty has worked with other faculties in defining a thesis writing course for graduate students.

Concern: Monitoring of individual PhD project work needs improvement.

Action Since QEF1 the monitoring of PhD project work has been improved. The monitoring was aligned with the other faculties within the School.

The Faculty took a strategic decision to first focus on restructuring the BS programmes and consequently the MS programmes. The restructuring of the BS programmes is close to be finished.

Reasons for slow progress include unclear follow-up processes and handover when a new faculty/department head takes over. Furthermore, the University's incentive program does not support quality improvement work.

Teaching and Learning

The Faculty has put a huge effort into restructuring the BS programmes in order to create a clearer identity for the students and thus establishing better student experience. This included detailed discussion with the industry, students, faculty members on content and purpose of the programmes.

The process was threefold: to align faculty´s view on what is engineering, to gather information on what is good and what needs improvement and to construct a programme based on the other two. The first phase started with two questions: what is engineer thinking and what is industrial engineering? Part of the faculty reflected on engineer thinking based on ABET and drew a generic causal loop diagram of engineer thinking. The purpose was to guide further development. The Department of Industrial Engineering then discussed in detail what is the field about, what is the focus taken in the University and how should this be reflected in the new programme. The result is the 5 field focus where the fundamental thinking is *system and processes*, the tools are *decision analytics* and there are three main areas: *operation management* (to manage stability), *technology and innovation management* (to manage change) and *engineering management* (for strategy). Information on current status was gathered from three sources: faculties experience, student workshop on current pros and cons and industry workshop on what is good with current student competence set, what is needed in the industry and the foreseen future development of industrial engineers' carrier in the industry. The Department of Industrial Engineering then went through a series of of-site workshops and turned information from the previous two steps in a completely revised curriculum for the Industrial Engineering BS degree. This resulted in a redesign of most of the courses. All course content was also aligned and coordinated. The new programme will start in the autumn of 2019.

The quality of teaching and learning is continuously monitored and evaluated through student teaching and course evaluation surveys which are done two times each semester – at the mid-semester and at the end of the semester. Those surveys are used as indicators. If the indicators suggest there is a major problem, then the Faculty/Department Head will meet with the teacher and student representatives and discuss possible improvements.

Furthermore, at the end of the semester, the Faculty Head and the Department Head will have a meeting with student representatives; i.e., students' confidant and Head of the Students Association, where the student surveys are reviewed and discussed. In addition to this, the Faculty/Department Head makes visits to classes on a regular basis to discuss matters with the students and to encourage them to either report issues directly to the Faculty Head, to the Department Head or to the student´ confidant.

The following is a summary of the actions identified by the review committee to improve the quality of the Faculty's programmes.

Program objectives and learning outcomes
> The departments need to review and revise – if necessary – the objectives and the learning outcomes of their BS and MS programmes as well as the individual courses.

Teaching methods used in each course are in most cases the same as when the course was first introduced. Some changes have been introduced but these are completely up to each teacher and not coordinated.

Workload

The departments need to analyse the workload of their programmes and courses using the same methodology for calculation for both the teacher's and student's workload. If necessary, the workload needs to be adjusted in individual courses and coordinated between courses.

Electives

To strengthen the MS programmes the departments need to introduce new courses. This will address complaints made by students in a survey carried out by the Social Science Research Institute at the University. It is also believed that by introducing new courses the programmes will be more attractive to new students.

Student involvement

Students (BS, MS and PhD) need to have a more active role in the departments. Their roles and rights need to be formalised as well as their involvement in meetings, quality monitoring and revisions of courses and programmes.

PhD study structure

The required number of ECTS units for the PhD programme needs to be adjusted to match 3 years of study. The course requirements are 30 ECTS in addition to 180 ECTS thesis – a total of 210 ECTS. It is expected that the students finish in 3-4 years, but all PhD funding is for 3 years.

Management of programmes

The assessments and learning outcomes need to be better aligned to the learning objectives. Teachers are responsible for their course assessment and are encouraged to use appropriate methods. However, there is no formal control on the assessments by the department and no alignment between course assessments.

The PhD rules and procedures; e.g., mid-way examination, and criteria for deciding when a thesis can be defended, need to be documented and made available to faculty.
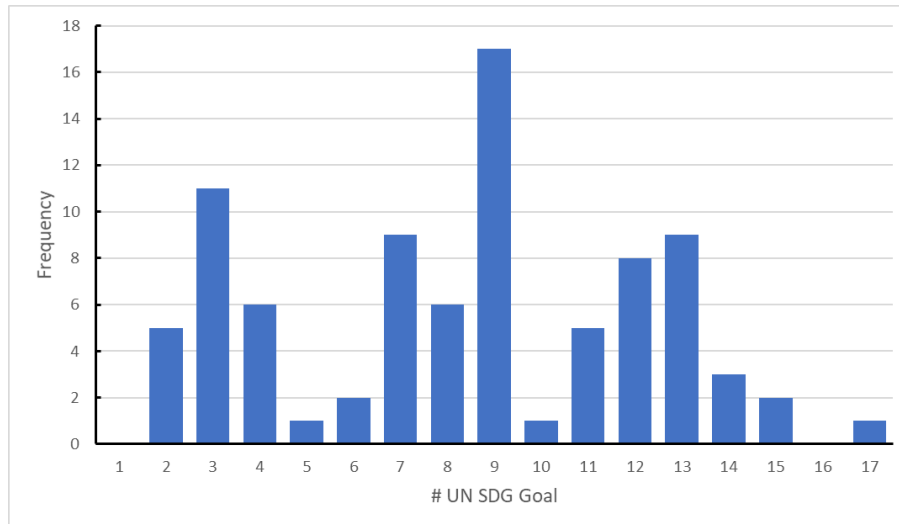
Management of Research

The faculty is active in research and faculty members predominantly publish their work at either high-quality conferences or in academic journals indexed by Web of Science or Scopus. Figure 1 shows the faculty's research interests mapped into the United Nations' Goals for Sustainable Development (SDGs).

There is an ongoing work on defining research strategy for the School and the faculties. According to the work plan, the faculties have until October 2019 to define their research plans and then the School's Science Committee will create a draft of general School's research strategy which will be presented to the School's Board.

The Faculty's current draft of managing guidelines for managing research focuses on having all faculty members active in research and fulfilling the University's minimum requirements for research. In addition, the Faculty is concerned about maintaining a balance between

research and teaching; for four consecutive years (2014-2017) the teaching load in the faculty was 151%.

New academic staff members receive a teaching discount for the first 2-3 semesters and a research start-up grant to facilitate a rapid start for their research. The Faculty also tries to shield the newly joined faculty members from accepting administrative duties and advises them about prioritising.

Figure 1.   The Faculty's research interests mapped into the United Nations' Goals for Sustainable Development (SDGs).

The current draft of the research management strategy is based on what has been practiced for many years. The main challenge is lack of appropriate facilities for those faculty members that do experimental work. The Faculty (and the academics) have – in most cases – been able to solve housing problems. In most cases the time required to find housing is too long and a solution is found long after the projects begin. In some cases, the housing is solved by temporarily moving teaching equipment and in some cases movable housing (cargo containers) have been brought in and positioned close to the University.

The current draft of the research management strategy has an impact section which has not been part of the Faculty's research management before. It is important that all faculty members contribute to maintaining and expanding the Faculty's visibility and reputation. It is suggested that each faculty member should do at least two actions each year on the following list:

- Write newspaper articles, blog posts and social media posts
- Interview on radio/TV or podcast
- Public presentation
- Presentation to colleagues
- Participate in events
- Presentations at high schools
- Write about the research and put on the Faculty's webpage.

Follow-up Processes

The Faculty Head and the department heads are fully committed to addressing the issues and concerns identified in this self-review report. Learning from the QEF1 experience, the issues must be standing items on the Faculty and Department meeting agendas. Faculty Head will report on the progress regularly to the School Board.

Faculty Head reports formally to the School Dean on the status of the implementation and plans for next year together with other relevant QA matters and this will be followed up in the School Board. The School Dean will subsequently make use of this report in a status report for all faculties in the School, which will be submitted to the Quality Committee. The Quality Committee writes a short report to the Rector, which will subsequently be discussed in a meeting between the Chair of the Quality Committee, the Director of Quality Management and Rector, Vice-Rectors. Deans of Schools and the Managing Director of the Central Administration.

Appendix 1 Key Faculty figures

Table 1 Overview of present Study Programmes within the Faculty

Name of Study Programme	Cycle[1]	Degree	Credits (ECTS)
Department of Computer Science			
TÖL261 Computer Science	1.2	BS	60/120/180
HBV261 Software Engineering	1.2	BS	180
REI441 Computational Engineering	2.2	MS	120
TÖL431 Computer Science	2.2	MS	120
HBV442 Software Engineering	2.2	MS	120
REI561 Computational Engineering	3	PhD	210
TÖL561 Computer Science	3	PhD	210
HBV561 Software Engineering	3	PhD	210
Department of Industrial Engineering			
IÐN262 Industrial Engineering	1.2	BS	180
IÐN441 Industrial Engineering	2.2	MS	120
IÐN561 Industrial Engineering	3	PhD	210
Department of Mechanical Engineering			
EVF264 Chemical Engineering	1.2	BS	180
VÉL262 Mechanical Engineering	1.2	BS	180
LVF442 Bioengineering	2.2	MS	120
VÉL441 Mechanical Engineering	2.2	MS	120
LVF561 Bioengineering	3	PhD	210
VÉL561 Mechanical Engineering	3	PhD	210

[1] See National Qualification Framework for Higher Education No. 530/2011.

Table 2 Faculty members as of 1 September 2018 and sessional teachers 2017, number (No.) and full time-equivalent (FTE).

	Male		Female		Total	
	No.	FTE	No.	FTE	No.	FTE
Professors	18	18.00	3	3.00	21	21.00
Associate Professors	3	3.00	0	0.00	3	3.00
Assistant Professors	1	0.51	2	1.50	3	2.01
Adjunct Lecturers	2	1.49	0	0.00	2	1.49
Total	24	23.00	5	4.50	29	27.50
Sessional teachers	60	8.22	20	2.11	80	10.33

Table 3 Age of Faculty members as of 1 September 2018

Total	<30 No.	30-39 No.	40-49 No.	50-59 No.	>59 No.	Total No.	Total %
Professors	0	3	7	4	7	21	72
Associate Professors	0	0	1	2	0	3	10
Assistant Professors	0	3	0	0	0	3	10
Adjunct Lecturers	0	1	0	1	0	2	8
Total	0	7	8	7	7	29	100
%	0	24	28	24	24	100	

Table 4 Period of Employment of Faculty members (years) as of 1 September 2018

Total	<5 No.	5-15 No.	16-24 No.	25-39 No.	>40 No.
Professors	5	9	3	4	0
Associate Professors	1	1	1	0	0
Assistant Professors	2	0	0	0	0
Adjunct Lecturers	3	0	0	0	0
Total	11	10	4	4	0
%	38	35	14	14	0

Table 5 Research output of Faculty members, based on the Evaluation System for the Public Universities in Iceland, expressed by mean research points (A) and research points from peer-reviewed publications (B) per FTE.

	2014 A	2014 B	2015 A	2015 B	2016 A	2016 B	2017 A	2017 B	Mean A	Mean B
Faculty	25.4	18.3	37.6	30.1	31.9	25.5	28.5	20.6	30.9	23.6
School	41.8	31.6	43.4	32.4	39.0	29.7	39.1	27.5	40.8	30.3
University	31.7	24.1	37.8	24.7	37.1	25.1	34.8	22.8	35.4	24.2

Table 6 Teaching obligations (%) of Faculty members and sessional teachers divided between departments.

Department	Faculty members				Sessional teachers		Total
	Teaching [h]	Teaching ratio [%]	Teaching Duties [h]	Teaching load [%]	Teaching [h]	Teaching ratio [%]	Hours
Computer Science	11 474	53.7%	9024	127.2%	9 898	46.3%	21 372
Industrial Engr.	5 624	59.8%	3330	168.9%	3 782	40.2%	9 406
Mechanical Engr.	7 283	61.2%	6551	111.2%	3 911	38.8%	11 894

Table 7 Key financial numbers.

Budget 2018	MISK			1000 € (1€ = 127,75 ISK)		
Revenues	School	Fac.	%School	School	Fac.	%School
Total from UI	2.709	492	18%	21.206	3.849	18%
Research funds						
Internal	138	27	20%	1.083	214	20%
National	539	131	24%	4.216	1.023	24%
International	213	118	55%	1.669	926	55%
Other income	279	23	8%	2.182	178	8%
Total revenues	**3.878**	**791**	**20%**	**30.355**	**6.190**	**20%**
Expenses						
Salaries	2.681	525	20%	20.988	4.113	20%
Facilities	387	55	14%	3.028	433	14%
Operating costs	567	138	24%	4.439	1.080	24%
Total	**3.635**	**719**	**20%**	**28.456**	**5.628**	**20%**

Table 8 Total number of students, number of entrants, retention rate for first year, and completion rate (4-year mean).

Programme	No. of students			No. of entrants[3]	Retention rate	No. of graduates	Completion rate[4]
	Total no.	Full time[1]	Part time[2]				
Dept. of Computer Science							
TÖL261	372	185	149	94	53	73	66
HBV261	121	84	23	32	74	28	81
REI441	4	1.8	1.3	1.3	25	1	67
TÖL431	20	2.8	9.5	3.5	33	2	63
HBV442	9.5	1.3	5.8	1.8	50	1.3	78
REI561	1.8	1.8	-	0.3	-	0.5	50
TÖL561	3.0	2.8	-	1.3	-	0	-
HBV561	0.3	0.0	-	0.0	-	0	-
Dept. of Industrial Engineering							
IÐN262	131	93	31	45	56	29	90
IÐN441	25	14	8	8	68	9	65
IÐN561	2.5	1.5	-	0.3	-	0.8	50
Dept. of Mech. Engineering							
EVF264	49	32	12	21	69	3.5	33
VÉL262	109	75	27	30	62	28	80
LVF442	1.5	0.5	0.5	0.5	-	0	-
VÉL441	26	14.8	7.5	10	48	10	68
LVF561	0.8	0.8	-	0.3	-	0.3	100
VÉL561	3.0	2.3	-	0.5	-	0.3	0

[1] > 22.5 ECTS completed. For PhD students > 1 ECTS completed.

[2] 1-22 ECTS completed.

[3] For all programmes except PhD, no. of students completing at least one examination in first term.

[4] 2-year rate for diploma, 4-year rate for BA/BS, 3-year rate for MA/MS, 5-year rate for PhD

Appendix 2: Action plan for teaching and learning and the management of research

Table 9 Action plan resulting from the QEF2 work.

	Actions	How	Deadline	Resp.
	Review and revise learning outcomes of courses and programmes	Collaboration within departments	2020	HD
	Review and revise course material and teaching methods	Work with teachers, provide tools and introduce them.	2020	HF+HD
	Improve quality in large undergraduate classes	Consider dividing up classes	2020	HF+HD
	Add course on research methods and scientific writing.	Joint interdisciplinary course that is currently created.	2020	HF+DS
	Coordinated assessment plan for departments	Template	2020	HD
	Analyse and coordinate workload in courses and between courses	Template	2020	HD
	Increase number of relevant elective courses	New courses + generate thematic lists for each programme	2021	HD
	Formalize student welcome and orientation	Write down guidelines for welcoming and orienting new students.	10/2019	HF
	Formalise student's involvement in the Faculty; e.g., in management and in the development of courses/programmes.	Define the rights and duties of students as well as updating the faculty and department meeting procedures and protocols.	10/2019	HF
	Document PhD rules and procedures; e.g., mid-way examination, and criteria for deciding when a thesis can be defended.	Ask the graduation committee to document their work practices.	10/2019	HF
	Improve the structure of the PhD program.	Adjust the number of ECTS units to match 3 years of study.	6/2020	HF+HD
	Improve the facilities for graduate students	Reorganize VR2	2021	HF+DS
	Develop a research plan for the faculty		10/2019	HF
	Increase the faculty's visibility to the Icelandic public.	Formalise a strategy for the Faculty	2019	HF+HD
	Introduce potential research projects for undergraduate and graduate students	Organize a bi-annual event where faculty members introduce their research	2019	HF
	Repeat survey on employability and satisfaction with the BSc degree	Contact graduated students.	2019	HF
	Faculty handbook	Containing guidelines and rules	2019	HF+HD
	Improve international comparison of faculty	Set benchmarking indicators for comparing with other universities.	2020	HF

Abbreviations used:

    HF: Head of Faculty,

    HD: Heads of departments,

    DS: Dean of School