

Diploma Supplement

This Diploma Supplement follows the model developed by the European Commission, Council of Europe and UNESCO/CEPES. The purpose of the supplement is to provide sufficient independent data to improve the international 'transparency' and fair academic and professional recognition of qualifications (diplomas, degrees, certificates etc.). It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It should be free from any value judgements, equivalence statements or suggestions about recognition. Information in all eight sections should be provided. Where information is not provided, an explanation should give the reason why.

1 Information identifying the holder of the qualification

- 1.1 Family name:
- 1.2 Given name(s):
- 1.3 Place and date of birth:
- 1.4 Student identification number or code:

Information identifying the qualification

2.1 Name of qualification :

Master of Science

Study programme: Joint International Master in Smart Systems Integration (SSI).

The study programme is a two-year Master's Programme (120 ECTS) under the European Union's Erasmus Mundus Programme. SSI is based on cooperation between Heriot-Watt University (HWU) in Scotland, Budapest University of Technology and Economics (BME) in Hungary and University College of Southeast Norway (HSN) in Norway. The students spend their first semester at HWU, their second semester at HSN and their third semester at BME. For the fourth semester (the master project), the students are distributed among the three Universities.

2.2 Main field(s) of study for the qualification:

Smart systems integration: MEMS and microsystem technology, microfabrication and micromachining, system level co-design of MEMS, IC and RF circuits, integration of MEMS, sensors and microelectronics. The Joint International Master in Smart Systems Integration is a specialised degree within the field of microsystem technology and is aimed at providing the students with both a basic competence and a high degree of specialised competence to meet the needs of the smart systems industry.

2.3 Name of awarding institution in original language (and in English):

Joint International Master in Smart Systems Integration is issued jointly by:

Heriot-Watt University – HWU - in Scotland

Høgskolen i Sørøst-Norge (University College of Southeast Norway) – HSN – in Norway

Budapesti Műszaki és Gazdaságtudományi Egyetem (Budapest University of Technology and Economics) – BME – in Hungary

The students spend at least one semester at each of the three Universities.

2.4 Name of institution administering studies (in original language):

Heriot-Watt University

2.5 Language(s) of instruction/examination:

English

3 Information on the level of the qualification

3.1 Level of qualification:
Master Degree.

3.1.1 Distinction

Students with high academic performance throughout the whole study will be awarded a Master Degree with Distinction. The requirements for obtaining the Distinction is based on the consistent outstanding academic performance of the student based on the homogenised grading system of the three Partner Institutions. The Master Degree with Distinction is given by the Exam Board.

3.2 Official length of the programme:
2 years in full-time mode (120 ECTS credits)

3.3 Access requirements:

3-year bachelor degree (180 ECTS credits) with specialization relevant to the master programme subject (including electrical engineering, electronics, computer engineering, physics, materials science, mechanical engineering, biomedical engineering or a closely related discipline). The requirements for competence in English are TOEFL (iBT) 90, IELTS 6.5 or Cambridge CAE grade B.

4 Information on the contents and results gained

4.1 Mode of study:
Full-time.

4.2 Programme requirements:

The aims of the Joint International Master in Smart Systems Integration are:

- To enable students to develop core and advanced skills in Smart Systems Integration
- To prepare students for a career in Smart Systems Technology

Understanding, knowledge and cognitive skills (academic and industrial relevance)

- Critical understanding of the principal physical models, terminologies, conventions, concepts and tools underpinning the theory, techniques and practices of integrated smart systems.
- Understanding and use of a significant range of skills, techniques and practices in smart systems integration and a range of specialized skills, research and investigation techniques, and practices informed by leading
- Critical understanding of the importance of microelectronic design in the creation of integrated smart systems.
- Application-based knowledge and skills related to the broad range of activities within the domain of smart systems integration, and specialized knowledge of manufacturing and integration of smart systems.
- Development of detailed knowledge of diverse software, hardware and theoretical tools relevant to Smart Systems Integration.

Scholarship, enquiry and research (academic relevance)

- Abilities to critically understand and apply relevant theories, techniques and technologies to develop analytical and design skills.
- Development and utilization of advanced problem-solving skills and techniques for the creation of original and imaginative solutions for general and specialist issues.
- Capability of critical analysis, through review and analysis of current research and trade press literature.
- Understanding of research ethics, and practices to appropriately build on the work of others.

Industrial commercial and professional practices (industrial relevance)

- Demonstration of critical awareness of current legal, societal, ethical, economical and professional issues within the discipline, especially in nanotechnology and biomedical applications.
- Making of informed judgements with incomplete or inconsistent data, or where there are no professional or ethical codes or practices for guidance, gained through the close interaction with industry throughout the study programme.

Autonomy, accountability and working with others (academic and industrial relevance)

- Working autonomously and within a team, as appropriate, demonstrating a capability for both taking and critically reflecting on roles and responsibilities, implemented through group based projects and laboratory work.

Communication, numeracy and ICT (academic and industrial relevance)

- Development and demonstration of skills and techniques in communication with peers and academic/industrial staff, using a range of appropriate methods to suit different levels of knowledge and expertise within the audience.
- Development and demonstration of critical knowledge and skills in the planning and usage of generic and specialised software tools and numerical techniques to create, present and communicate information on projects and processes.

The study programme is application-oriented, including the use of smart systems for particularly important application areas such as the biomedical area. The study programme is thus interdisciplinary in its nature, building on disciplines such as electrical/ electronic engineering, mechanical engineering and materials engineering, as well as the physical/ chemical sciences, and also involving computer science and bioengineering. The SSI study programme shall qualify successful students for:

- Industrial work in Smart System design, processing and integration; project management and quality assurance
- Research work, in particular admission to PhD programmes worldwide (including the programmes of the Consortium Universities)
- Work in governmental bodies addressing microsystems industry & research

4.3 Programme details:

See enclosed transcripts.

The Joint International Master in Smart Systems Integration is conducted over four semesters, where the student has spent at least one semester at each of the three Universities, as described in the table below:

Semester 1	Semester 2	Semester 3	Semester 4
September – December	January – July	August – January	February – August
30 ECTS credits	30 ECTS credits	30 ECTS credits	30 ECTS credits
Fundamentals of smart systems: Sensors and Actuators Integration and Packaging	Smart systems specialization: Manufacturing, Characterization and Biomedical applications	Design for integrated smart systems: Top-down design, mixed signal and microelectronics for smart systems	Master project
Heriot-Watt University	University College of Southeast Norway	Budapest University of Technology and Economics	One of the three institutions

The modules making up the Joint International Master in Smart Systems Integration:

Course Name	Semester	ECTS
Sensors and Actuators	S1	7.5
Advanced Packaging and Integration	S1	7.5
Fundamentals of Smart Systems Integration	S1	7.5
Advanced Writing Skills and Research Preparation	S1	5.0
Local Culture	S1	2.5
Total first semester, at HWU	S1	30
Manufacturing Processes for Smart Systems	S2	5
Measurement and Characterization	S2	10
Micro and Nano Biological Systems	S2	10
Norwegian Society, Language and Culture	S2	5
Total second semester, at HSN	S2	30
System Level Design	S3	4
System Level Design Laboratory	S3	4
IC and MEMS Co-Design	S3	4
IC and MEMS Design Laboratory	S3	4
Complex Design	S3	4
Individual Design Laboratory	S3	5
Introduction to Hungarian Language and Culture	S3	5
Total third semester, at BME	S3	30
Master Project (One of the three Institutions)	S4	30
Total		120

4.4 Grading scheme and, if available, grade distribution guidance:

The Joint International Master in Smart Systems Integration uses the ECTS grading scale. Grades or marks are given in the systems used at each of the Partner Institutions, and converted to ECTS grades according to the following tables:

	HWU	ECTS
Excellent	≥70 %	A
Very good	60-69 %	B
Good	50-59 %	C
Satisfactory	40-49 %	D
Sufficient	35-39 %	E
Fail	Fail (<35 %)	F

	HSN	ECTS
Excellent	A	A
Very good	B	B
Good	C	C
Satisfactory	D	D
Sufficient	E	E
Fail	F	F

	BME	ECTS
Excellent	5	A
Very good	4	B
Good	3	C
Satisfactory	2	D
-	-	-
Fail	1 (Fail)	F

Grading percentage table for the group of students that was admitted to the SSI Programme Autumn
<year>:

<i>Course name</i>	<i>Grading percentage</i>						<i>Number of students</i>
	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	
Sensors and Actuators							
Advanced Packaging and Integration							
Fundamentals of Smart Systems Integration							
Advanced Writing Skills and Research Preparation							
Local Culture							
Manufacturing Processes for Smart Systems							
Measurement and Characterization							
Micro and Nano Biological Systems							
Norwegian Society, Language and Culture							
System Level Design							
System Level Design Laboratory							
IC and MEMS Design							
IC and MEMS Design Laboratory							
Individual Design Laboratory							
Complex Design							
Introduction to Hungarian Language and Culture							
Master Project							

Grading percentage table for the SSI Programme the *X* cohorts graduated by <year>:

<i>Course name</i>	<i>Grading percentage</i>						<i>Number of students</i>
	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	
Sensors and Actuators							
Advanced Packaging and Integration							
Fundamentals of Smart Systems Integration							
Advanced Writing Skills and Research Preparation							
Local Culture							
Manufacturing Processes for Smart Systems							
Measurement and Characterization							
Micro and Nano Biological Systems							
Norwegian Society, Language and Culture							
System Level Design							
System Level Design Laboratory							
IC and MEMS Design							
IC and MEMS Design Laboratory							
Complex Design							
Individual Design Laboratory							
Introduction to Hungarian Language and Culture							
Master Project							

Credit System and Grading

Courses are measured according to the European Credit Transfer System standard (ECTS credits). The full time workload is 60 ECTS credits per year for two years.

Grades are awarded according to a grading scale from A (highest) to F (lowest), with E as the minimum pass grade. A pass/fail mark may be given for some examinations.

- A Excellent - An excellent performance, clearly outstanding. The candidate demonstrates excellent judgement and a high degree of independent thinking.
- B Very good - A very good performance. The candidate demonstrates sound judgement and a very good degree of independent thinking
- C Good - A good performance in most areas. The candidate demonstrates a reasonable degree of judgement and independent thinking in the most important areas.
- D Satisfactory - A satisfactory performance, but with significant shortcomings. The candidate demonstrates a limited degree of judgement and independent thinking.
- E Sufficient - A performance that meets the minimum criteria, but no more. The candidate demonstrates a very limited degree of judgment and independent thinking.
- F Fail – A performance that does not meet the minimum academic criteria. The candidate demonstrates an absence of both judgment and independent thinking.

5 Information on the function of the qualification

5.1 Access to further study:

Completion of the Master's degree is a qualification to apply for PhD programmes.

6 Additional information

6.1 Additional information:

The candidate has completed a joint degree, see section 2.3.

6.2 Further information sources:

Joint International Master in Smart Systems Integration, web-address:
<http://ssi-master.eu/>

7 Certification of the supplement

7.1 Date:

7.2 Signature:

7.3 Capacity:

7.4 Official stamp or seal:

8 Information on the Scottish, Hungarian and Norwegian higher education system

8.1 The Scottish higher education system

Introduction

Scotland has 19 autonomous higher education institutions (HEI). This diverse range of HEIs includes 14 campus based universities, one distance-learning university, an educational partnership institution based in the Highlands and Islands, one art school, a conservatoire and an agricultural college. All are funded by the Scottish Government via the Scottish Funding Council (SFC), which is responsible for distributing funding to individual institutions for teaching, research and associated activities (<http://www.scotland.gov.uk/Topics/Education/UniversitiesColleges/16640>). The HEIs are independent, self-governing bodies, active in teaching research and scholarship. They decide the degrees they offer; the conditions on which they are awarded and the admissions arrangements. Degrees and other higher education qualifications are legally owned by the awarding institution, not by the state.

The HEIs offer qualifications at undergraduate (Bologna first cycle) and postgraduate (Bologna second and third cycle) levels. In Scotland, the law distinguishes the power to award degrees on the basis of completion of taught programmes from the power to award research degrees. Universities have powers to award taught and research degrees. Other HEIs have powers to award taught degrees and offer programmes leading to research degrees awarded by partner universities. Lists of institutions with powers to award degrees and institutions recognised by authorities in Scotland as being able to offer courses leading to a degree of another HEI may be found at www.bis.gov.uk. A small number of taught degrees are available in colleges of further education by the authority of a duly empowered HEI.

Qualifications

The types of qualifications awarded at undergraduate (first cycle) and postgraduate level (second and third cycles) in Scotland are described in the Framework for Higher Education Qualifications in Scotland (FHEQ) which includes qualifications descriptors, developed with the higher education sector (<http://www.qaa.ac.uk>). In 2006 the FHEQ was verified as being compatible with the European Higher Education Framework (www.qaa.ac.uk): Short Cycle qualifications = Diploma of Higher Education; First Cycle qualifications = Bachelors Degrees with Honours and Bachelors Degrees; First Cycle Intermediate awards = Graduate Certificates and Diplomas; Second cycle = Masters Degrees and Intermediate awards (Postgraduate Certificates and Diplomas); Third cycle = Doctoral Degrees.

The Framework is an integral part of a wider national framework: the Scottish Credit and Qualifications Framework that covers all forms of programmes and qualifications from school to Doctorates (see www.scqf.org.uk).

Institutions use SCQF credit points for students entering or transferring between programmes or institutions, and use ECTS for transfers within the European area

Admission

Requirements for particular programmes are set by the HEIs which offer a range of routes for entry and/or credit transfer into their programmes, and admit students whom they believe have the potential to complete their programmes successfully. The Open University is an open entry institution.

The most common qualification for entry to higher education is the Higher or Advanced Higher or, for entrants from the rest of the UK, the General Certificate of Education at 'Advanced' level (including the "advanced supplementary") or comparable qualifications. Four or five Highers are normally taken in the 5th and 6th year of secondary school or at a college of further education and studied in considerable depth, involving coursework and final examinations. Advanced Highers are taken in the 6th year. A major route into Degrees, often with transfer of credit, is from Higher National Qualifications offered in colleges of further education.

Quality assurance

Standards of qualification and the quality of the student learning experience are maintained by the HEIs using a range of processes including extensive use of external examiners. In some subject areas, Professional and Statutory Bodies have a role to ensure that programmes meet the needs and standards of the particular profession.

HEIs in Scotland demonstrate their public accountability for quality and standards through a national quality assurance framework that has a strong focus on enhancement as follows:

- HEIs take account of a QAA published, UK wide code of practice for quality assurance, and UK subject level 'benchmark statements' on standards (see www.qaa.ac.uk).
- Subject level issues are addressed by HEIs internal reviews conducted in accordance with guidance issued by the Scottish Funding Council (www.sfc.ac.uk/).
- External reviews are conducted by the Quality Assurance Agency for Higher Education in Scotland (QAA). The Agency is an independent body established to provide public confidence in the quality and standards of higher education. It involves students in all its quality assurance activities including as members of review teams. The Agency publishes reports on the outcomes of reviews and the confidence that can be placed in the HEIs' arrangements for assuring and enhancing standards and quality, and for ensuring that they provide public information that is complete, accurate and fair (see www.qaa.ac.uk).

A national development service supports students in their role as active participants in assuring and enhancing quality and standards (see www.sparqs.ac.uk).

8.2 The Hungarian higher education system

This description presents the Bologna-type training, and was prepared in 2008 for diplomas awarded within the Bologna-type system.

Types of Institutions and Institutional Control

The establishment and operation of higher education institutions are regulated by the 2005 Higher Education Act. Operating within the legal framework of the Higher Education Act, Hungarian higher education institutions are autonomous, state-recognised, state or non-state (church or private) institutions. The state-recognised institutions are listed in the Annex of the Higher Education Act. There are two types of higher education institutions, *egyetem* (university) and *főiskola* (college). Both universities and colleges may offer courses in all three cycles. A university is a higher education institution that is eligible to provide Master courses in at least two fields of study, and to offer Doctorate course as well as to confer Doctoral degrees. The rules applying to universities offering courses in the field of art or religious education are different from the aforementioned.

Types of Programmes and Degrees Awarded

The consecutive training cycles of the higher education leading to a higher education degree are *alapképzés* (Bachelor course), *mesterképzés* (Master course) and *doktori képzés* (Doctorate course). Bachelor and Master courses are taught in consecutive cycles, in the form of divided training, or in cases specified by law in the form of undivided, one-tier training.

In addition to the aforementioned, higher education institutions may conduct higher-level vocational training and postgraduate specialist training, as well as can offer adult education within the framework of lifelong learning.

Higher education institutions apply a credit system based on the European Credit Transfer System. Accordingly, one credit stands for 30 hours of student workload.

Approval/Accreditation of Programmes and Degrees

A higher education institution may launch Bachelor and Master courses after having obtained the consent thereto in the expert opinion of the Hungarian Accreditation Committee of Higher Education, and following the central registration of the given course. In the case of each Bachelor and Master course, the law determines the programme and graduation requirements, thus, all the knowledge and competencies whose acquisition is the precondition for the diploma to be awarded in respect to the given programme.

The launching of Doctorate courses is within the powers of the universities, having obtained the consent thereto in the expert opinion of the Hungarian Accreditation Committee of Higher Education and having fulfilled other conditions prescribed by law.

It is the task of the Hungarian Accreditation Committee of Higher Education to authorize and assess the quality of education and scientific activities of the higher education institutions. The Hungarian Accreditation Committee of Higher Education once in every eight years examines in which field of study, discipline of science and at what level of training does an institution fulfil accreditation requirements in respect of lecturers and infrastructure. The assessment also extends to examine the adequacy of the institutional quality development scheme. Within the framework of programme accreditation the Hungarian Accreditation Committee of Higher Education examines the institutional programme curricula, the fulfilment of programme and graduation requirements, as well as the adequacy of the lecturers' qualifications and the quality of the infrastructure in respect to the given programme.

Organisation of Studies

Students studying in Bachelor and Master courses complete their studies by passing a final examination. The final examination may consist of the defence of the degree thesis, and additional oral, written or practical examinations.

The first higher education degree is the *alapfokozat* (Bachelor degree) along with a professional qualification. A Bachelor course requires gaining 180-240 credits. The length of the programme is 6-8 semesters.

The second higher education degree is the *mesterfokozat* (Master degree) along with a professional qualification. Built on a Bachelor course Master courses require gaining 60-120 credits. The length of the programme is 2-4 semesters.

Specialised Graduate Studies

Higher education institutions may also offer *szakirányú továbbképzés* (postgraduate specialist training) for Bachelor and Master degree holders. Through the completion of 60-120 credits a specialised qualification can be obtained. Students complete their studies by passing a final examination. The length of the programme is 2-4 semesters.

Doctorate

Built on a Master course and a Master degree the *doktori képzés* (Doctorate course) requires gaining at least 180 credits. The length of the programme is 6 semesters. Following a Doctorate course, in a separate degree awarding procedure, the scientific degree “Doctor of Philosophy” (abbreviation: PhD), or in art education “Doctor of Liberal Arts” (abbreviation: DLA) may be awarded.

Grading Scheme

The assessment of knowledge is generally carried out according to a five-grade scale: excellent (5), good (4), satisfactory (3), pass (2), and fail (1) or a three-grade scale: excellent (5), satisfactory (3), fail (1). Nevertheless, higher education institutions may also use other systems for assessing if they are comparable to those mentioned above.

Access to Higher Education

The number of students admitted to higher education is limited. Applicants’ ranking is based on their secondary school grades and their *érettségi vizsga* (secondary school leaving examination) results or based solely on the latter, considering the interest of the applicant. The requirement for admission to Bachelor and undivided one-tier Master courses is the secondary school leaving examination taken – as a rule – after the completion of the 12th grade of a secondary school, certified by *Érettségi bizonyítvány* (secondary school leaving certificate). The admission to certain programmes is based on an additional aptitude test or a practical examination. To Master courses students can be admitted if they possess *Főiskolai oklevél* (college-level degree) or *Egyetemi oklevél* (university-level degree) or a Bachelor degree. To postgraduate specialist training students can be admitted if they possess college or university-level degree, or a Bachelor or a Master degree. Only applicants with university-level degree or Master degree may be admitted to Doctorate courses. Higher education institutions may set additional requirements for admission to Master, postgraduate specialist and Doctorate courses.

National Sources of Information

Ministry of Human Resources, Hungarian ENIC/NARIC², Hungarian Accreditation Committee of Higher Education³, Educational Authority⁴, National Higher Education Information Centre⁵

1 Web site: www.okm.gov.hu

2 Web site: www.naric.hu

3 Web site: www.mab.hu

4 Web site: www.oh.gov.hu

5 Web site: www.felvi.hu

8.3 The Norwegian higher education system

All public and private higher education in Norway is subject to Act No. 15 of 1 April 2005 relating to Universities and University Colleges.

Higher education institutions comprise of universities, specialized university institutions, university colleges, and various private higher education institutions with recognised study programmes <http://www.nokut.no/Accredited-Institutions>. Approximately 90% of the students in Norway attend state institutions.

Norway introduced bachelor's, master's and PhD degrees in 2002. Regulations covering these degrees, professional qualifications/titles awarded by the institutions and prescribed length of study, are codified in Royal Decree number 1574 of 16 December 2005 <https://lovdata.no/dokument/SF/forskrift/2005-12-16-1574>

Accreditation and evaluation

All institutions of higher education are subject to the authority of the Ministry of Education and Research. The Norwegian Agency for Quality Assurance in Education (NOKUT), an independent national agency for the accreditation and evaluation of higher education, is responsible for assessing the quality of programmes and institutions. The agency has accreditation powers for all higher education in Norway.

Admission requirements for higher education

The minimum requirement for admission is the successful completion of Norwegian upper secondary education (13 years of schooling, extended from 12 years from 1997). Upon graduation pupils are presented with the Upper Secondary School Leaving Certificate. Alternatively, admission may be gained by means of other qualifications recognised as being equivalent to the general matriculation standard. Some fields of study have additional entrance requirements.

Degrees and qualifications

The "Høgskolekandidat" degree is obtained after two years of study (120 "studiepoeng"/ECTS). Holders of this degree may continue their studies and obtain a bachelor's degree. This degree is offered at state university colleges and a few other institutions.

The Bachelor's degree is awarded by all state universities, specialized university institutions, university colleges and a good number of other higher education institutions, both private and public. The nominal length of studies to obtain this degree is three years of study (180 "studiepoeng"/ECTS).

The Master's degree is awarded by state universities, specialized university institutions, several university colleges and some private institutions. The degree is normally obtained after two years of study (120 "studiepoeng"/ECTS), following the completion of a bachelor's degree. An important part of this degree is independent work/thesis, earning between 30 and 60 "studiepoeng"/ECTS.

In the fields of medicine, psychology, veterinary science and theology; professionally oriented degrees/qualifications are awarded after completing six years of studies.

The Doctoral degree Philosophiae Doctor PhD is awarded after three years of study (180 "studiepoeng"/ECTS), following the completion of a master's degree or a six-year professionally oriented degree/qualification. Doctoral programmes are offered by all universities and specialized university institutions, by some state university colleges and also by a few private institutions.

There are a few exceptions to this degree structure, listed in the diagram attached.

Credit system and grading

The academic year normally runs from mid-August to mid-June and lasts for 10 months. Courses are measured in "studiepoeng", considered equivalent to the European Credit Transfer System standard (ECTS credits). The full-time workload for one academic year is 1500-1800 hours of study/60 "studiepoeng".

Grades are awarded according to a grading scale from A (highest) to F (lowest), with E as the minimum pass grade. A pass/fail mark is given for some examinations.

A - Excellent - An excellent performance, clearly outstanding. The candidate demonstrates excellent judgement and a high degree of independent thinking.

B - Very good - A very good performance. The candidate demonstrates sound judgement and a very good degree of independent thinking.

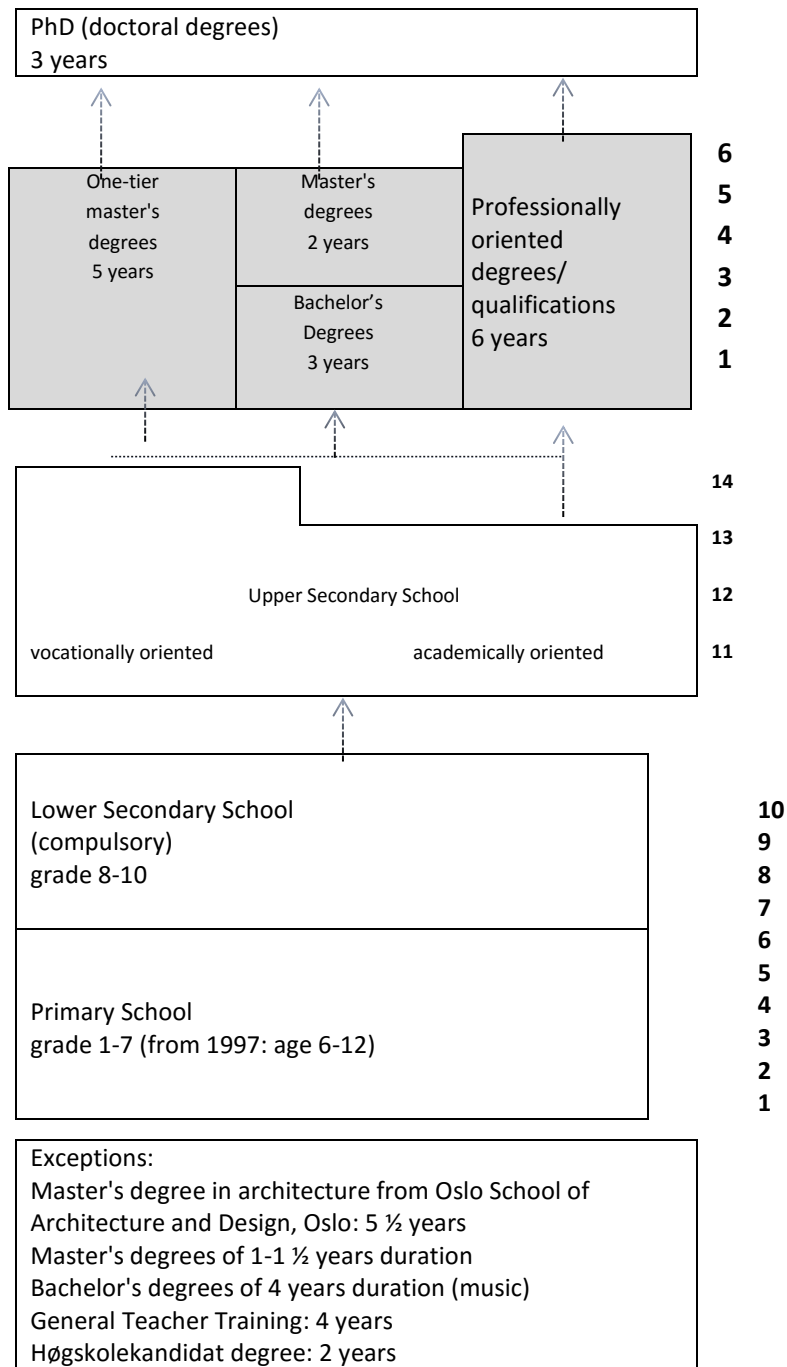
C - Good - A good performance in most areas. The candidate demonstrates a reasonable degree of judgement and independent thinking in the most important areas.

D - Satisfactory - A satisfactory performance, but with significant shortcomings. The candidate demonstrates a limited degree of judgement and independent thinking.

E - Sufficient - A performance that meets the minimum criteria, but no more. The candidate demonstrates a very limited degree of judgement and independent thinking.

F - Fail - A performance that does not meet the minimum academic criteria. The candidate demonstrates an absence of both judgement and independent thinking.

The Structure of the Norwegian Educational System and Degrees



Version: January 2011 - More information: <http://www.nokut.no>