



**RADBOUD UNIVERSITEIT NIJMEGEN**

**DIPLOMASUPPLEMENT**

# MASTER DIPLOMASUPPLEMENT

## Voorwoord

Het Diplomasupplement (DS) is gebaseerd op het model dat door de Europese Commissie, de Raad van Europa en UNESCO/CEPES is ontwikkeld. Dit supplement heeft tot doel informatie te verschaffen om de internationale vergelijkbaarheid van diploma's te verbeteren en de academische en professionele erkenning van diploma's te bevorderen. Het is ontworpen om een omschrijving te geven van de aard, de context, de inhoud en de status van de opleiding die door de persoon aangegeven op het originele diploma gevolgd is en succesvol afgerond is. Degenen die niet bekend zijn met het Nederlandse hoger onderwijsstelsel of de Radboud Universiteit Nijmegen, kunnen hiervan in de bijlagen een algemene beschrijving vinden.

## Informatie over de bezitter van het diploma

<b>Achternaam</b>	Bieger
<b>Voornaam</b>	Jordi Erwan
<b>Geboortedatum</b>	9 december 1985
<b>Geboorteplaats</b>	Voorburg, Nederland
<b>Studentnummer</b>	0416371

## Opleidingsgerelateerde informatie

<b>Soort opleiding</b>	Master of Science (MSc)
<b>Instelling</b>	Radboud Universiteit Nijmegen, een bijzondere universiteit, van overheidswege erkend en bekostigd.
<b>Naam opleiding</b>	Artificial Intelligence
<b>Accreditatie</b>	De masteropleiding Artificial Intelligence is geaccrediteerd.
<b>Informatie</b>	De masteropleiding Artificial Intelligence biedt een tweejarig programma in de wetenschappelijke kunstmatige intelligentie, bestaande uit een cursorische specialisatie in hetzij Cognitive Engineering, hetzij Cognitive Research, hetzij een door de examencommissie goedgekeurde vrije afstudeerrichting, gevolgd door een afstudeerproject (stage en scriptie).
<b>Voertaal</b>	Nederlands en Engels
<b>Duur opleiding</b>	De officiële duur van de opleiding is 120 European Credits (EC), 60 EC per jaar. 1 European Credit staat voor 28 uur; 1680 uur totaal per jaar.
<b>Toelatingseisen</b>	1. Toegelaten tot de masteropleiding Artificial Intelligence worden diegenen die: <ul style="list-style-type: none"><li>• beschikken over het getuigschrift van een bacheloropleiding Kunstmatige Intelligentie aan één der Nederlandse universitaire opleidingen;</li><li>• in het bezit zijn van het bewijs van toelating, dat het College van Bestuur voor het desbetreffende studiejaar afgeeft (zie hieronder).</li></ul> 2. Tot de opleiding worden onder nadere condities toegelaten: diegenen die beschikken over het getuigschrift van een bacheloropleiding Informatica, Informatiekunde of Psychologie aan de Radboud Universiteit Nijmegen. 3. De nadere condities genoemd in lid 2 worden vastgesteld door de examencommissie.

Bewijs van toelating:

1. Voor het bewijs van toelating komt in aanmerking degene die:

- in het bezit is van een getuigschrift dat ten minste gelijkwaardig is aan het getuigschrift van de bacheloropleiding Kunstmatige Intelligentie;
- anderszins naar het oordeel van de examencommissie blijkt heeft gegeven van geschiktheid voor het volgen van de opleiding.

2. De examencommissie kan bepalen dat de kandidaat aanvullende onderdelen binnen de bacheloropleiding Kunstmatige Intelligentie behaalt alvorens deze toegelaten wordt tot de masteropleiding.

#### **Eindoelen**

Met de Nijmeegse masteropleiding Artificial Intelligence wordt beoogd:

- studenten gevorderde kennis, vaardigheden en inzicht op het gebied van de kunstmatige intelligentie bij te brengen;
- studenten een gevorderde academische vorming bij te brengen;
- studenten het hierboven genoemde op zodanig niveau bij te brengen dat dit aansluit op de bacheloropleiding op het gebied van de kunstmatige intelligentie;
- studenten zodanig op te leiden, dat deze na voltooiing van deze opleiding in staat zijn tot het onder beperkte supervisie zelfstandig verrichten van wetenschappelijk onderzoek op het gebied van kunstmatige intelligentie.

Eindtermen van de Nijmeegse masteropleiding Artificial Intelligence:

Studenten die de opleiding met goed gevolg hebben afgerond beschikken over:

- gevorderde actieve kennis, vaardigheden en inzicht op het gebied één der aangeboden afstudeerrichtingen;
- specialistische kennis over een nader te kiezen onderwerp binnen de afstudeerrichting;
- de vaardigheid om onder beperkte supervisie zelfstandig onderzoek te verrichten op het gebied van de kunstmatige intelligentie, en hierover schriftelijk en mondeling te rapporteren;
- de vaardigheid om onder beperkte supervisie zelfstandig werkzaam te zijn in de werkvelden die passen bij de gekozen afstudeerrichting.

#### **Verdere studie**

Masters in de Artificial Intelligence zijn gekwalificeerd tot het doen van een promotie-onderzoek.

#### **Arbeidsmarkt**

Masters in de Artificial Intelligence zijn inzetbaar in een breed spectrum van posities. De werkzaamheden van Masters in Artificial Intelligence liggen op het gebied van onder meer:

- fundamenteel en toegepast wetenschappelijk onderzoek;
- adviesfuncties waarvoor een wetenschappelijke opleiding in de kunstmatige intelligentie gewenst is;
- analyse van complexe en slecht omschreven problemen en ontwerp van software-oplossingen daarvoor;
- gebruikersonderzoek, kenniselicitatie en software-evaluatie;
- onderwijs in de kunstmatige intelligentie en gerelateerde disciplines.

#### **Status**

#### **Adres**

Onderwijsinstituut voor Psychologie en Kunstmatige Intelligentie  
Radboud Universiteit Nijmegen  
Comeniuslaan 4  
Postbus 9102  
6500 HC Nijmegen  
www.ru.nl

## Studentgebonden informatie

### Afstudeerrichting

Cognitive Engineering houdt zich bezig met het formeel modelleren van taken en problemen waarvoor intelligentie vereist is en het ontwerpen van software voor het uitvoeren c.q. oplossen daarvan, in het bijzonder met betrekking tot technische aspecten van geavanceerde mens-machine interactie.

Cognitive Research houdt zich bezig met de bestudering en verklaring van menselijk cognitief functioneren door middel van theorievorming, computationele simulatie en experimentatie; dit zowel in fundamentele zin als toegepast op de menselijke aspecten van mens-computer interactie

### Individuele programma-informatie en behaalde resultaten

Het volgende overzicht laat de programmaonderdelen zien die de student gevolgd heeft, en geeft per onderdeel het aantal European Credits en het eindcijfer, en wel per academisch jaar.

#### Verklaring van de alfanumerieke resultaten

G	goed	ZG	zeer goed
VLD	voldoende	V	voldaan
RV	ruim voldoende	VS	vrijstelling
VR	vrijstelling		

Jaar	Vak	Ec	Cijfer
Jaar 1	Computational Intelligence	6	9.0
	Geavanceerd Programmeren	6	7.0
	Information Retrieval	6	9.5
	Business Rules	6	7.5
	Verdieping human-computer interactie	6	7.5
	Practicum kennisverwerving voor expertsystemen	6	8
	Embodied and embedded cognition	6	8
	Gebruikersmodellering en ondersteuning	6	8,5
	Inleiding Patroonherkenning	6	8,5
	Testtechnieken	6	7.0
Jaar 2	Vak	Ec	Cijfer
	Abstractie en Compositie in Programmeren	6	10
	Objectgericht ontwerp	6	9.5
	Scriptie Kunstmatige Intelligentie: Stimulation Effects in SSVEP-Based BCIs	17	8
Stage Kunstmatige Intelligentie	31	9	

## Opmerkingen

### Vakken bij andere universiteiten

Indien relevant volgt hierna welke vakken de student gevolgd heeft bij andere universiteiten, de naam van

deze universiteiten, en het land waar de universiteiten gevestigd zijn.

Niet van toepassing.

**Extra-curriculaire vakken en punten**

Indien relevant volgen hierna de extra-curriculaire vakken die de student gevolgd heeft, het aantal European Credits per vak en het eindcijfer van het vak. Als een van de vakken bij een andere universiteit gevolgd is, dan is deze in bovenstaand schema terug te vinden.

Niet van toepassing.



## Verklaring van de examencommissie

*Examen datum* 17 augustus 2010

*Judicium:* cum laude

*Handtekeningen*

A handwritten signature in blue ink, appearing to read 'H. Spinkhuizen-Kuyper', written over a horizontal line.

*Functie* Voorzitter en secretaris van de examencommissie

## **Radboud Universiteit Nijmegen**

Bijlage 1

De Radboud Universiteit Nijmegen is een internationaal georiënteerde studentgerichte onderzoeksuniversiteit waar kwaliteit volgens internationale standaarden voorop staat. Ze is actief binnen het brede spectrum van de wetenschap en overschrijdt de grenzen van de traditionele academische disciplines. Met haar wetenschappelijk onderwijs en onderzoek geeft zij mede richting aan maatschappelijke ontwikkelingen en scheidt zij een intellectueel klimaat dat essentieel is voor onze samenleving. Haar medewerkers streven naar verhoging van de kwaliteit van onderzoek en onderwijs.

De Radboud Universiteit Nijmegen is een vrijplaats voor vernieuwend onderzoek. Wetenschappelijke ontwikkelingen en maatschappelijke vraagstukken zijn een permanente bron van inspiratie voor haar onderzoek. Het onderzoek speelt zich af aan de grenzen van kennis en kunde. Inspanningen zijn erop gericht nieuwe ideeën te ontwikkelen en inzichten te verwerven. Met haar onderzoek draagt zij nadrukkelijk en gewetensvol bij aan het verleggen van de grenzen van het weten in het belang van deze samenleving.

Het onderwijs van de Radboud Universiteit Nijmegen is geïnspireerd door eigen onderzoek en recente wetenschappelijke ontwikkelingen. Het is persoonsgericht en reikt verder dan de grenzen van het eigen vakgebied. Studenten zijn actieve deelnemers aan de academische gemeenschap. De Radboud Universiteit leidt studenten op tot kritische en geëngageerde academici, die met een visie op wetenschap en maatschappij verantwoordelijke posities in de samenleving willen innemen.

De naam Radboud verwijst naar de oorsprong van de universiteit, de Radboud Stichting die de universiteit in 1923 oprichtte. De naam bevestigt de band met de katholieke gemeenschap. Mede vanuit deze traditie staat ze open voor vragen rond wetenschap, samenleving en zingeving.

# MASTER DIPLOMASUPPLEMENT

## Preface

*This Diploma Supplement follows the model developed by the European Commission, Council of Europe and UNESCO/CEPES. The purpose of this supplement is to provide 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, 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. For those who are not familiar with the system of higher education in the Netherlands or Radboud University Nijmegen, an appendix with additional information has been added.*

## The holder of the qualification

<i>Family name(s)</i>	Bieger
<i>Given name(s)</i>	Jordi Erwan
<i>Date of Birth</i>	December 9, 1985
<i>Place of Birth</i>	Voorburg, the Netherlands
<i>Student ID</i>	0416371

## Qualification-related information

<i>Qualification</i>	Master of Science (MSc)
<i>Institution</i>	Radboud University Nijmegen, private university and state recognized, state regulated.
<i>Name study</i>	Artificial Intelligence
<i>Accreditation</i>	The Master's degree programme in Artificial Intelligence has been accredited.
<i>Information</i>	<p>The Master's degree programme in Artificial Intelligence offers a two-year programme in scientific artificial intelligence, consisting of a specialisation course in either Cognitive Engineering, Cognitive Research or a different course track approved by the Examining Board, followed by a graduation project (internship and Master's thesis).</p> <p>Language: Dutch and English.</p> <p>Duration: The official length of the programme is 60 ECTS credits per academic year, and 120 ECTS credits in total</p> <ul style="list-style-type: none"><li>• <b>Requirements 1.</b> Admitted to the Master's degree programme in Artificial Intelligence are: those who have a Bachelor's degree in Artificial Intelligence obtained at one of the universities in the Netherlands;</li><li>• those who have a Bewijs van Toelating (written confirmation of admission) to this study programme, issued by the University Board of Radboud University Nijmegen (see below).</li></ul> <p>2. Admitted on certain conditions are: those who have a Bachelor's degree in Computer Science, Information Science or Psychology obtained at Radboud University Nijmegen.</p> <p>3. The conditions referred to in Paragraph 2 are determined by the Examining Board.</p>

Bewijs van Toelating:

1. Eligible for a Bewijs van Toelating are:



- those who have a diploma that is at least equivalent to the diploma of the Bachelor's degree programme in Artificial Intelligence.
- those who, according to the Examining Board, have otherwise proven that they qualify for the study programme.

2. The Examining Board may determine that a candidate must successfully complete additional subjects within the Bachelor's degree programme in Artificial Intelligence before he/she is to be admitted to the Master's degree programme.

**Objectives**

The aims of the Master's degree programme in Artificial Intelligence at Radboud University Nijmegen are:

- to provide students with advanced knowledge, skills and insight in the field of artificial intelligence;
- to provide students with an advanced academic training;
- to provide students with the abovementioned at a level that fits the Bachelor's degree programme in Artificial Intelligence;
- to train students in such a manner that, after graduation, they will be able to independently conduct scientific research in the field of artificial intelligence.

Graduates of the Master's degree programme have:

- advanced active knowledge, skills and insight regarding one of the specializations;
- specialist knowledge of a graduation subject within the specialization;
- the skills required to independently design and carry out artificial intelligence research under limited supervision, and to report on this verbally and in writing;
- the skills required to independently function under limited supervision in the fields of action corresponding with the chosen specialization.

**Further study**

Masters of Artificial Intelligence are qualified for a PhD position.

**Job market**

Masters of Artificial Intelligence can be employed in a wide range of positions. Activities of Masters of Artificial Intelligence are in the fields of among others:

- fundamental and applied scientific research;
- advisory positions for which a university education in artificial intelligence is required;
- analysis of complex and ill-defined problems and design of software solutions for them;
- user requirements research, knowledge elicitation and software evaluation;
- professional education in artificial intelligence and related disciplines.

**Status**

**Address**

Institute of Psychology and Artificial Intelligence  
 Radboud Universiteit Nijmegen  
 P.O. Box 9102  
 6500 HC Nijmegen  
 The Netherlands  
 www.ru.nl



## Student-related information

### Main fields of study

Cognitive Engineering is aimed at formally modelling tasks and problems for which intelligence is required and designing software to execute c.q. solve them, in particular regarding the technical aspects of advanced human-computer interaction.

Cognitive Research is aimed at studying and explaining human cognitive functioning by theory formation, computational simulation and experimentation; the aforementioned both fundamentally as applied to human aspects of human-computer interaction.

### Individual programme details and results

The following index lists the courses of the programme the student has attended, the number of European Credits attributed to each course and the final mark the student has acquired for the course, per academic year of study.

### Explanation of alphanumerical results

G	good	ZG	very good
VLD	sufficient	V	satisfactory
RV	amply sufficient	VS	exemption
VR	exemption		

Year 1	Course	Ec	Mark
	Computational Intelligence	6	9.0
	Advanced Programming	6	7.0
	Information Retrieval	6	9.5
	Business Rules	6	7.5
	Advanced in Human-computer-interaction	6	7.5
	Knowledge acquisition for expertsystems	6	8
	Embodied and embedded cognition	6	8
	User modelling and support	6	8.5
	Introduction to Pattern Recognition	6	8.5
	Testing Techniques	6	7.0
Year 2	Course	Ec	Mark
	Abstraction and Composition in Programming	6	10
	Object oriented design	6	9.5
	Thesis Artificial Intelligence Stimulation Effects in SSVEP-Based BCis	17	8
	Training period Artificial Intelligence	31	9

## Remarks

### Courses from other universities

## Student-related information

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## Remarks

### Courses from other universities

If relevant, the section below will list which of the courses were attended at other universities, as well as the name of these universities and the country they reside in.

Not applicable.

**Elective courses and credits**

The index below lists, if relevant, extra-curricular courses the student has attended, the number of European Credits attributed to each course and the final mark the student has acquired for the course. If any of the courses were attended at another university, they are listed in the index above.

Not applicable.



### Certification of the supplement

*Exam date* August 17, 2010

*Judicium:* cum laude

*Signatures*



*Capacity* Chairman/Chairwoman and secretary of the Examination Board

## **Radboud University Nijmegen**

Attachment 1 Radboud University Nijmegen is an internationally active, student-oriented research university in which quality according to international standards is the main focus. It is active in a wide range of scientific disciplines and goes beyond the traditional academic boundaries. With its university education and scientific research Radboud University Nijmegen helps shape social developments and creates an intellectual climate essential to society. The main aim of its staff is to increase the quality in research and education.

Radboud University Nijmegen is dedicated to innovative research. Scientific developments and social issues are a permanent source of inspiration for its research, which is conducted on the interface of knowledge and ability. All efforts are directed at developing new ideas and acquiring new insights. Through its research Radboud University Nijmegen emphatically and conscientiously helps push back the frontiers of knowledge in the interest of society.

The education offered by Radboud University Nijmegen is inspired by its own research and current developments in science. It is tailored to the needs of the individual student and crosses disciplinary boundaries. The students at Radboud University Nijmegen are active participants in the academic community. Radboud University trains them to become critical and committed members of society who are willing to take up responsible positions and have a clear vision on science and society.

The name Radboud refers to the origin of our university: the Radboud Foundation that founded the university in 1923. The name confirms the existing ties with the Catholic community. Thanks in part to this tradition Radboud University Nijmegen has kept an open mind towards science, society and the search for meaning.



## The Education System in the Netherlands

The higher education system in the Netherlands is based on a three-cycle degree system, consisting of a bachelor, master and PhD. Until 2002, the first two cycles at research universities were combined in a single integrated cycle. The three-cycle system was officially introduced in the Netherlands at the beginning of the academic year 2002-2003, but degrees from the former, integrated system can be awarded until 2007-2009. For this reason, both the old and new systems will be described here.

The Netherlands has a binary system of higher education, which means that there are two types of programmes: research-oriented education (*wetenschappelijk onderwijs, WO*), traditionally offered by research universities, and professional higher education (*hogere beroepsonderwijs, HBO*), traditionally offered by hogescholen, or universities of professional education. In this description, the Dutch abbreviations *WO* and *HBO* will be used.

### PRIMARY AND SECONDARY EDUCATION

Children are allowed to begin school at the age of four, but are not legally required to do so until the age of five.

Primary education lasts eight years (of which seven are compulsory), in the last year of which pupils are advised as to the type of secondary education they should pursue.

Secondary education, which begins at the age of 12 and is compulsory until the age of 16, is offered at several levels. *VMBO* programmes (four years) combine general and vocational education, after which pupils can continue in senior secondary vocational education and training (*MBO*) lasting one to four years. The two programmes of general education that grant admission to higher education are *HAVO* (five years) and *VWO* (six years). Pupils are enrolled according to their ability, and although *VWO* is more rigorous, both *HAVO* and *VWO* can be characterized as selective types of secondary education. The *VWO* curriculum prepares pupils for university, and only the *VWO* diploma grants access to *WO*. The *HAVO* diploma is the minimum requirement for access to *HBO*. The last two years of *HAVO* and the last three years of *VWO* are referred to as the *tweede fase* (literally, second phase), or upper secondary education. During these years, pupils focus on one of four subject clusters (*profielen*), each of which emphasizes a certain field of study in addition to satisfying general education requirements. Each cluster is designed to prepare pupils for programmes of study at the tertiary level. A pupil enrolled in *VWO* or *HAVO* can choose from the following subject clusters:

- 1) Science and Technology (*Natuur en Techniek*)
- 2) Science and Health (*Natuur en Gezondheid*)
- 3) Economics and Society (*Economie en Maatschappij*)
- 4) Culture and Society (*Cultuur en Maatschappij*)

### SENIOR SECONDARY VOCATIONAL EDUCATION AND TRAINING (*MBO*)

Senior secondary vocational education and training (*MBO, secundair beroepsonderwijs*) is offered in the areas of economics, technology, health, personal care, welfare and agriculture. *MBO* programmes vary in length from one to four years as well as in level (1 to 4). Graduates of *VMBO* programmes are eligible for admission to *MBO*, and completion of *MBO* programmes at level 4 qualifies pupils for access to *HBO*.

### HIGHER EDUCATION

Higher education in the Netherlands is offered at two types<sup>1</sup> of institution: research universities (*universiteiten*) and universities of professional education (*hogescholen*). Research universities include general universities, universities specializing in engineering and agriculture, and the Open University. Research universities are primarily responsible for offering research-oriented programmes (*wetenschappelijk onderwijs, WO*). Universities of professional education include general institutions as well as institutions specializing in a specific field such as agriculture, fine and performing arts, or teacher training. Universities of professional education are primarily responsible for offering programmes of higher professional education (*Hoger Beroepsonderwijs, HBO*), which prepare students for particular professions. These tend to be more practically oriented than programmes offered by research universities.

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<sup>1</sup>The higher education system also includes a third branch, with a relatively small number of students, known as *internationaal onderwijs (IO)*, or international education. *IO* offers advanced training courses originally designed for people from developing countries whose jobs require highly specialized knowledge. Problem-oriented courses and programmes of various types, including master's programmes, are offered in a wide range of specific fields. The emphasis can be either on research or on the practical application of knowledge. Courses are given in English and last from a few weeks to two years. With one exception (the Institute of Social Studies in The Hague), the institutes of international education do not offer PhD programmes themselves but have concluded agreements with Dutch universities which enable their students to pursue doctorates. Admission requirements vary according to the course in question, but in most cases a bachelor's degree or its equivalent is required for admission to a master's degree programme, and a master's degree for admission to a PhD programme. An additional requirement is work experience. International education is subsidized by the government, which finances the institutes and provides scholarships for students.

## WO until 2002

Dutch research universities provide education and conduct research in a wide range of disciplines: language and culture, behaviour and society, economics, law, medical and health sciences, natural sciences, engineering, and agriculture. Until 2002, initial study programmes lasted four years in most fields, but five years in agriculture, engineering, mathematics and most natural sciences, at the end of which the *doctorale getuigschrift* (doctoraal degree) or *getuigschrift van het afsluitend examen* (final examination degree certificate) was awarded. Integrated study programmes in medical and health sciences lasted either five years (dentistry) or six years (medicine, pharmacy, veterinary medicine). The first year of every programme referred to as the *propedeuse*, provided students with introductory courses fundamental to the field in question. In the years that followed, every *doctoraal* programme featured training in research methodology and completion of a thesis as required components.

Graduates of *doctoraal* programmes have been permitted by law to use a particular title, depending on the discipline. Graduates in engineering and technology and in agriculture and the natural environment received the title of *ingenieur*, abbreviated to *ir.* Graduates in law obtained the title of *meester*, abbreviated to *mr.* Graduates in all other disciplines obtained the title of *doctorandus*, abbreviated to *drs.* All graduates could also opt to use the title Master (M.) if they wished. Graduation from a *doctoraal* programme made one eligible to pursue a doctorate.

All research universities in the Netherlands were entitled to award the country's highest academic degree, the *doctoraat*, which entitles a person to use the title *doctor*, abbreviated to *dr.* The process by which a doctorate is obtained is referred to as the *promotie*. The doctorate is primarily a research degree, for which a dissertation based on original research must be written and publicly defended. The minimum amount of time required to complete a doctorate was four years.

## HBO until 2002

Dutch universities of professional education prepare students for a wide variety of careers in seven sectors: agriculture, engineering and technology, economics and business administration, health care, fine and performing arts, education (teacher training), and social welfare. Initial study programmes lasted four years, at the end of which the *Getuigschrift Hoger Beroepsonderwijs* or *HBO* degree was awarded. The first year of every programme, referred to as the *propedeuse*, consisted of introductory courses fundamental to the discipline in question. In addition to lectures, seminars, projects and independent study, students were required to complete an internship or work placement (*stage*) which normally takes up part of the third year of study, as well as a final project or a major paper in the fourth year.

Graduates of an *HBO* programme in engineering and technology or agriculture and the natural environment received the title *ingenieur*, abbreviated to *ing.* Graduates in all other disciplines obtained the title *baccalaureus*, abbreviated to *bc.* All graduates could also opt to use the title *Bachelor* (*B.*) if they wished. *HBO* graduates are fully qualified to practise their profession without any further study, licensing or registration with a professional association.

## After 2002

Since September 2002, higher education system in Netherlands has been organized around a three-cycle degree system consisting of bachelor, master and PhD degrees.<sup>2</sup> At the same time, the ECTS credit system was adopted as a way of quantifying periods of study. The higher education system continues to be a binary system, however, with a distinction between research-oriented education (*wetenschappelijk onderwijs*, *WO*) and professional higher education (*hoger beroepsonderwijs*, *HBO*).

The focus of degree programmes determines both the number of credits required to complete the programme and the degree which is awarded. A *WO* bachelor's programme requires the completion of 180 credits (3 years) and graduates obtain the degree Bachelor of Arts or Bachelor of Science (BA/BSc), depending on the discipline. An *HBO* bachelor's programme requires the completion of 240 credits (4 years), and graduates obtain a degree indicating the field of study (for example, Bachelor of Engineering, B. Eng., or Bachelor of Nursing, B. Nursing). The old title appropriate to the discipline in question (*bc.*, *ing.*) may still be used.

A *WO* master's programme requires the completion of 60, 90 or 120 credits (1, 1.5 or 2 years). In engineering, agriculture, and math and natural sciences, 120 credits are always required. Graduates obtain the degree of Master of Arts or Master of Science (MA/MSc). Dutch university higher education offers a new type of master's study - the research master's programme - aimed at preparing students for entrance into a PhD track or for a career in research. The research master's programmes require 120 credits to be completed (i.e., 2 years). Graduates obtain the degree of Master of Science (MSc). The old title appropriate to the discipline in question (*drs.*, *mr.*, *ir.*) may still be used. An *HBO* master's programme requires the completion of 60 to 120 credits and graduates obtain a degree indicating the field of study (for example, Master of Social Work, MSW).

<sup>2</sup>Degree programmes in dentistry (300 credits) and medicine and veterinary medicine (360 credits) will continue to be offered as integrated programmes until approximately 2007-2008. Programmes in pharmacy will continue to require completion of 360 credits, divided into a bachelor's and a master's phase (3 + 3 years).



The third cycle of higher education, leading to a doctor's degree, will be offered only by research universities in the same way as describe above.

### Requirements for Admission to Higher Education

For access to *WO* bachelor's programmes, students are required to have a *VWO* diploma or to have completed the first year (60 credits) of an *HBO* programme. The minimum access requirement for *HBO* is either a *HAVO* diploma or a level-4 *MBO* diploma. The *VWO* diploma also grants access to *HBO*. For access to both types of higher education, pupils are required to have completed at least one of the subject clusters that fulfills the requirements for the higher education programme in question. A quota, or *numerus fixus*, applies for access to certain programmes, primarily in the medical science, and places are allocated using a weighted lottery. Potential students older than 21 years of age who do not possess one of the qualifications mentioned above can qualify for access to higher education on the basis of an entrance examination and assessment.

The only access requirement for the Open University is that applicants be at least 18 years of age.

For access to all master's programmes, a bachelor's degree in one or more specified disciplines is required, in some cases in combination with other requirements. Graduates with an *HBO* bachelor's degree may have to complete additional requirements for access to a *WO* master's degree programme.

### Credit System and Grading

Workload is measured in credits (*studiepunten*). Until 2002, one credit represented one week of full-time study (40 hours, counting both contact hours and hours spent studying and preparing assignments). Study programmes offered by research universities and universities of professional education lasting four years required completion of a total of 168 credits, or 42 credits per year. The academic year was (and still is) 42 weeks long.

Since 2002, a student's workload is measured in ECTS credits, whereby according to Dutch law one credit represents 28 hours of work and 60 credits represent one full year of full time study. The grading system has been the same for several decades: the scale is from 1 (very poor) to 10 (outstanding). The lowest passing grade is 6; 9s are seldom given and 10s are extremely rare and grades 1-3 are hardly ever used.

### Accreditation and Quality Assurance

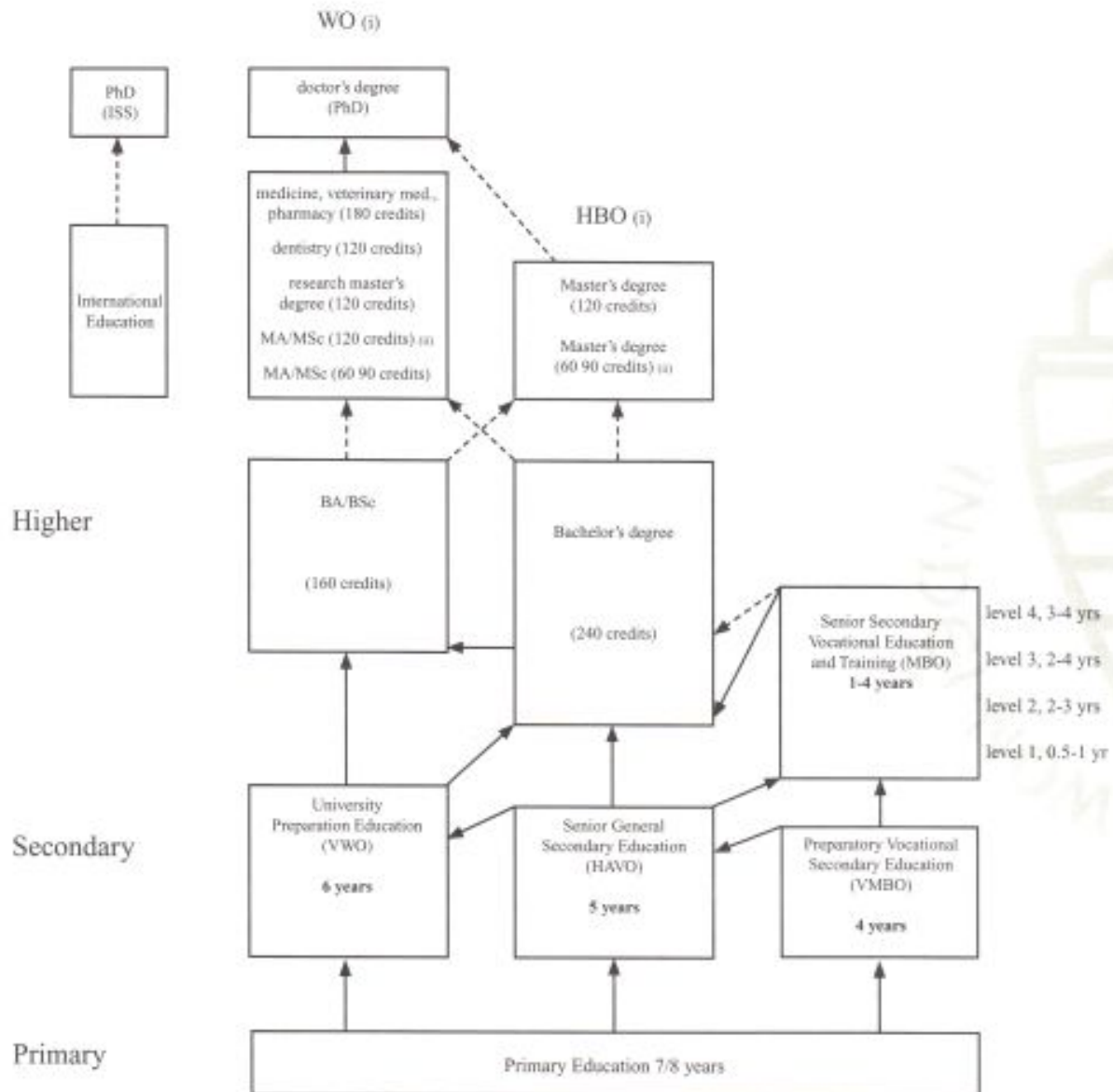
A guaranteed standard of higher education is maintained through a national system of legal regulation and quality assurance. The Ministry of Education, Culture and Science is responsible for legislation pertaining to education. The agriculture and public health ministries play an important role in monitoring the content of study programmes in their respective fields, and until 2002, the *VSNV* (Association of Universities in the Netherlands) and the *HBO-raad* (Netherlands Association of Universities of professional Education) were responsible for implementing the system of quality assurance.

This system has been recently converted to a system of accreditation. As of 2002, responsibility for accreditation lies with the Netherlands-Flemish Accreditation Organization (*NVAO*). According to the section of the Dutch Higher Education Act dealing with the accreditation of higher education (2002), all degree programmes offered by research universities and universities of professional education will be evaluated according to established criteria, and programmes that meet those criteria will be accredited: i.e. recognized for a period of six years. Only accredited programmes will be eligible for government funding, and students will receive financial aid and graduate with a recognized degree only when enrolled in, or after having completed, an accredited degree programme. Accredited programmes will be listed in the Central Register of Higher Education Study Programmes (*CROHO*) and the information will of course be available to the public.

Next to the accreditation of degree programmes, the Netherlands has a system by which the Ministry of Education, Culture and Science recognized higher education institutions by conferring on them the status of either *bekostigd* (funded) or *aangewezen* (approved). *Bekostigd* indicates that the institution is fully financed by the government. *Aangewezen* indicate that the institution does not receive funds from the government and has to rely on its own sources of funding. Whether a degree programme is offered by a 'funded' or an 'approved' institution, it must be accredited and registered in *CROHO* to be considered recognized.

According to legislation regarding accreditation, institutions are required to write on degree certificates the date that the degree programme in question was granted accreditation.

## Diagram of the Dutch Education System



- (i) WO = wetenschappelijk onderwijs  
HBO = hoger beroepsonderwijs
- (ii) Most WO master's degrees require completion of 60-90 credits: those in engineering, mathematics, natural sciences, agriculture and research master's require 120 credits, and those in pharmacy 180 credits. Programmes in dentistry (300 credits) and medicine/veterinary medicine (360 credits) are still offered as integrated programmes leading to only one degree. HBO master's degree require completion of between 60 and 120 credits.
- (iii) Only 1 of 4 types of VMBO qualifies for access to HAVO

\* a solid arrow (→) indicates a right to access  
\* a dotted arrow (---→) indicates that some form of selection or bridging requirement may be required.