Universität für Bodenkultur Wien

University of Natural Resources and Life Sciences, Vienna

Curriculum

for the Master's Programme in

INTERNATIONAL MASTER IN HORTICULTURAL SCIENCES

Programme classification no. 454

Effective date October 1st, 2014

CONTENTS

Preamble

The international master's programme "**International Master in Horticultural Sciences" (IMaHS)** is conducted and offered by eight European universities in collaboration – each providing high quality specialization in an individual specific field:

- Alma Mater Studiorum - University of Bologna (UNIBO; Università di Bologna, Italy),
- Technical University of Munich (TUM; Technische Universität München-Weihenstephan, Germany),
- Humboldt University of Berlin (HUB; Humboldt-Universität zu Berlin, Germany)
- University for Natural Resources and Life Sciences Vienna (BOKU; Universität für Bodenkultur Wien, Austria)
- Corvinus University of Budapest (COR; Budapesti Corvinus Egyetem, Hungary)
- Free University of Bozen-Bolzano (FUB; Bolzano, Italy)
- International Centre for Higher Education in Agricultural Sciences (Montpellier SupAgro, France),
- Institut supérieur des sciences agronomiques, agroalimentaires, horticoles et du paysage (Agrocampus Ouest, France).

§ 1 QUALIFICATION PROFILE

The master´s programme "International Master in Horticultural Sciences" (IMaHS) is a joint degree programme which serves to deepen and extend students' pre-vocational academic education, building on the basis provided by a bachelor degree programme (§ 51 [2] item 5 of the Universities Act UG 2002, Federal Law Gazette BGBl I no. 81/2009). The programme fulfils the requirements of Directive 2005/36/EC on the recognition of professional qualifications, article 11, letter e.

1a) Knowledge and personal and professional skills

Graduates of the programme will have gained technological, socio-economic and life-sciences expertise and competence focused on cultivation, control, management of highly value creating and minor horticultural crops. This expertise will enable them to develop inter-disciplinary solutions in the contexts of research, horticultural entrepreneurship and public domain. It will enable them to work for an increase of life standard and quality of life both in developing and developed countries. As well innovation and requirements for permanent improvement of processes, products and technologies are addressed.

Graduates will have gained the ability to understand, apply and evaluate actual techniques in a) biochemistry and molecular physiology of plants in horticultural biotechnology, b) environmental and ecological aspects of horticulture, c) design of experiments for studying environmental, technological and human impacts on the quantity and quality of horticultural crops, d) methodology of analyzing of horticultural plant-propagation, production systems and postharvest-management.

They will have developed the highly skilled ability to understand and reproduce scientific research in horticultural crop production, management and applications as well as knowledge-transfer in the fields of horticulture - from designing a research plan, data analysis up to

presentation of results and discussion to develop competence for future professional and scientific activities.

1b) Professional qualifications

The objective is to train and educate students on a high level in research-based knowledge and academic skills. All levels from plant-stands to genes are covered. Fields of expertise from biotechnology to sustainability and organic strategies are represented. The focus for students will be on theoretical studying to gain and improve academic qualifications and skills.

Graduates of the programme are qualified to start and develop future career profiles in: research and development (R&D); in the horticultural and related business and industries; horticultural nursery management; training, guidance and teaching; public administration and agricultural chambers as well as green technologies.

§ 2 ADMISSION REQUIREMENTS

Graduates of the following bachelor´s programmes offered by BOKU University of Natural Resources and Life Sciences, Vienna are eligible for admission with no further requirements on:

1. BSc Agricultural Sciences
2. BSc Viticulture, Oenology and Wine Economics
3. BSc Environment and Bio-Resources Management
4. BSc Landscape Architecture and Landscape Planning

Graduates of agricultural, horticultural and biological bachelor´s programmes offered by the partner universities within the consortium are also eligible for admission with no further requirements.

For graduates of other bachelor's programmes, mastery of the following learning outcomes is required for admission:

- Horticultural and agricultural plant-production (minimum 12 ECTS credits)
- Plant-health-management (plant protection) (minimum 6 ECTS credits)
- Horticultural/agricultural management, business and social sciences (minimum 6 ECTS credits)
- Life sciences (minimum 12 ECTS credits)
- Science of human nutrition or landscape or garden design (minimum 3 ECTS credits)

Preferably graduates from programmes such as "Horticulture", "Agriculture / Crop production", "Landscaping" "Biology / Botany" or "Human nutrition" are regarded qualified for the master´s programme "International Master in Horticultural Sciences".

Admission criteria also comprise English Language Skills at the Level B2 of the Common European Framework of References for Languages (CEFR). Equivalent test and their required minimum scores are as following:

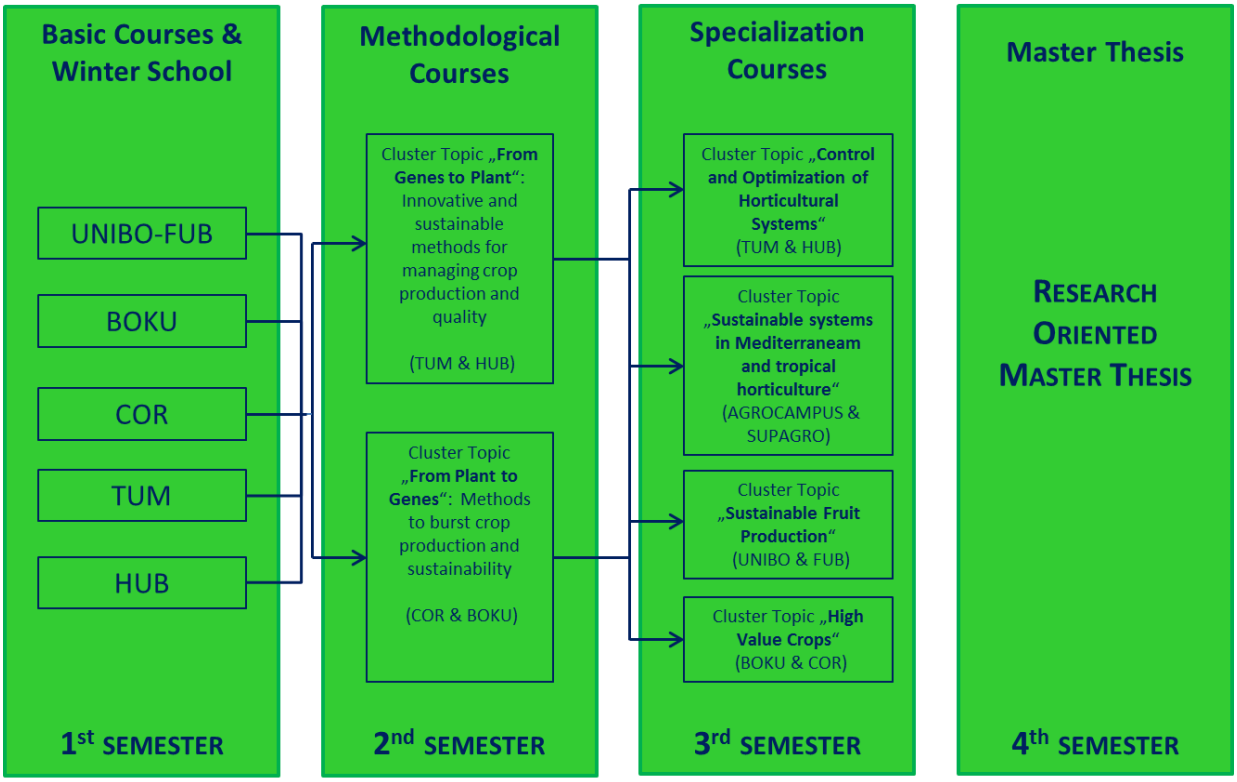
- Cambridge Certificate of Advanced English
- IELTS score 6.0 or better
- TOEFL (paper based 577 or computer-based 233 or 90-91 internet based)
- TOEIC (at least 785 points)

Admission is granted to prospective students who meet the admission criteria. The Joint Management committee will select candidates for admission and admission at one of the Parties is automatically accepted at all other Parties.

§ 3 PROGRAMME STRUCTURE

Registration for the first semester of the master´s programme "International Master in Horticultural Sciences" can be done at any of the partner universities:

- University of Natural Resources and Life Sciences Vienna" (BOKU)
- University of Bologna (UNIBO)
- Corvinus University of Budapest (COR)
- Humboldt University Berlin (HUB)
- Technical University Munich (TUM)



Each student has to study at 3 different universities in minimum; i.e. the student has to spend a minimum of 1 semester (30 ECTS credits) at three of the following university clusters: BOKU/COR, UNIBO/FUB, TUM/HUB, SupAgro/AgroCampus.

3a) Duration, total ECTS credits, and structure

The programme consists of courses and other requirements worth a total of 120 ECTS credits. This is equivalent to the duration of four semesters (a total of 3,000 60-minute credit hours). The programme is conducted entirely in English language.

Based upon the University-cluster's specialized topic chosen by the student, the amount of compulsory and elective courses can differ between the University-clusters. The total amount of compulsory, elective and free elective courses at BOKU are as following:

Compulsory courses:	30 ECTS credits
Elective courses:	60 ECTS credits
Master's thesis:	30 ECTS credits

The master's programme "International Master in Horticultural Sciences" consists of topics with modules, each comprising 5 or 6 ECTS credits and offered in the form of several courses with different characters (different to the partner universities) – in lectures, lecture and tutorial, seminar or project (in total 90 ECTS credits). The modules are offered at the different universities, their comparability is assured based on the learning outcomes.

The master´s thesis is 30 ECTS credits and is supervised by a competent professional person at the chosen university within the IMaHS network. A co-supervision by a second competent professional person at a cooperating university is recommended.

3b) Cluster Topic Structure

Students in the master´s programme "International Master in Horticultural Sciences" have free choice of mobility among the clusters, with a minimum of two mobility-activities during the master´s programme (1st semester = 1st university). Then two clusters have to be joined). The master´s thesis can be conducted at any of the partner universities. In case of the choice of a host-university it counts as fulfilment of one of the international mobility-activities).

1. Basic courses

The first semester is equally offered by University for Natural Resources and Life Sciences Vienna (BOKU), University of Bologna (UNIBO), Corvinus University of Budapest (COR), Humboldt University of Berlin (HUB) or the Technical University Munich (TUM).

The courses offered during the first semester aim to provide the essential knowledge needed to all students to successfully face the topics offered in the following semesters.

2. Methodological courses

Two different clusters offer jointly methodological courses in the second semester, whereas the students reside at the cluster-leading university and the supporting university in the cluster will offer courses through web based learning or staff mobility:

- Cluster Topic "From Plant to Genes" (joint offer by CORVINUS and BOKU)
- Cluster Topic "From Genes to Plant" (joint offer by TUM and HUB)

3. Specialization courses

Four different specialization clusters offer jointly courses in the third semester, whereas the students reside at the cluster-leading university and the supporting university in the cluster will offer courses through web based learning or staff mobility:

- Cluster Topic "High Value Crops" (joint offer by BOKU and CORVINUS)

- Cluster Topic “Control and Optimization of Horticultural Systems“ (joint offer by TUM and HUB)
- Cluster Topic “Sustainable Fruit-Production “ (joint offer by UNIBO and FUB)
- Cluster Topic “Sustainable Systems in Mediterranean and Tropical Horticulture“ (joint offer by SupAgro and AGROCAMPUS)

4. Master’s thesis

The fourth semester is designed to conduct the master’s thesis under academic supervision of competent professional persons. The master’s thesis can be conducted at any of the partner institutions within the consortium. It is recommended to choose a second supervisor from another partner-institution.

The topic of the master’s thesis has to be selected from one of the fields of horticulture present, respectively addressed, in the curriculum). Ideally the thesis creates significant scientific new value or knowledge.

3c) Three-pillar principle

The three-pillar principle is the central identifying characteristics of both the bachelor’s and master’s programmes offered at the University of Natural Resources and Life Sciences, Vienna. In the master’s programmes, the sum of the compulsory and elective courses is made up of at least all three “pillars”.

The master’s thesis, compulsory internship and free electives are excluded from the three-pillar rule.

15% technology and engineering
15% natural sciences
15% economic and social sciences, law

§ 4 COMPULSORY COURSES

Compulsory courses in the Cluster Topics “Basic Courses”, “Methodological Courses” and “Specialization Courses” worth a total of 30 ECTS credits are required to complete the master’s programme.

The following compulsory courses are required to complete the master’s programme:

Basic Courses - BOKU (home university)

Semester/Cluster Topic - Basic Courses BOKU **course title**	**Course type**	**ECTS credits**
Winter-school (offered by all partners together at a university of the consortium - changing each year; min. 3 ECTS)		
Winterschool	IP	3
Ecosystem and Plant Physiology (min. 6 ECTS)		
Water relations of plants	VO	3
Plant and Environment	VO	3
Methods in Horticultural Physiology	US	3
Ecology and Population Biology of Plants in Agro-ecosystems	VX	5
Plant Sensing, Response and Adaption to the Environment	SE	2
Advanced Plant Pathology (min. 6 ECTS)		
Laboratory diagnosis of Plant damages	UE	3
Plant Virology and Bacteriology	VU	3
Gene technology for plant pathologists (in Eng.)	VO	3
Managing Crop Growth, Yield and Quality (min. 9 ECTS)		
Physiology of crop nutrition	VO	4
Physiology of crop nutrition - Laboratory exercises	UE	2
Irrigation Design	VU	3
Plant Biotechnology	VO	3
Traditional and molecular aspects of grapevine breeding and selection	VS	3
Horticultural Management and Economics (min. 6 ECTS)		
Ethics in Organic agriculture	SE	3
E-Business in Agriculture and Food Economy	SE	3
Strategic management	PJ	3
System Analysis and Scenario Technique - Methods and Practises	SE	5
Agricultural Sciences for Developing Countries	VO	3

§ 5 ELECTIVE COURSES

30 ECTS credits of Elective courses in “Methodological Courses” and 30 ECTS credits in “Specialization Courses” (worth a total of 60 ECTS credits) are required to complete the master’s programme.

Methodological Courses: Cluster Topic “From Plant to Genes” – COR /BOKU

Students choosing the Cluster Topic “From Plant to Genes” are registered and stay at Corvinus University.

Cluster Topic "From Plant to Genes" COR **course title**	**Course type**	**ECTS credits**
Crop Biotechnology (Classical & Molecular Approaches) (min. 6 ECTS)		
Molecular genetics and gene technology of plants	-	3
Propagation biology of plants	-	3
Research and Evaluation methods in Horticultural Economics (min. 6 ECTS)		
Plant Stress Physiology	-	5
Molecular Genetics	-	4
System Analysis as a Research Method (min. 6 ECTS)		
Production ecosystems and forms of their regulation	-	3
Information systems in horticulture	-	3
Cultivation and Processing of Medicinal Plants	-	5
Environmental-friendly Horticulture (min. 6 ECTS)		
Natural resources and nature protection	-	3
Biological pest management	-	3
Organic farming	-	3
Bioactive Plant Compounds (min. 6 ECTS)		
Biologically active substances in horticultural species	-	2
Evaluation of fruit cultivars	-	4
Special plant compounds in nutrition and therapy	-	3
Wine terroirs	-	5

Specialization Courses "High Value Crops" – BOKU/COR

Students choosing the cluster topic "High Value Crops" are registered at BOKU, which offers the courses and Corvinus University cooperates via staff mobility and/or e-learning courses. 12 credits per Subject Area "Medicinal Plants and High Value Technologies", "Viticulture" (total of 24 ECTS credits) and 6 ECTS credits in the Subject Area "Wellbeing Plants and Organic Horticulture" have to be chosen.

Semester Topic - Specialization Courses **Cluster Topic "High Value Crops" BOKU** **course title**	**Course type**	**ECTS credits**
BOKU is offering the courses in this semester and Cluster Topic with an e-learning course of COR		
Medicinal Plants and High Value Technologies (min. 12 ECTS)		
Medicinal and aromatic plants	VO	3
Special Vegetable-growing	VY	3
Excursion of vegetable growing	EX	0,5
Plant nematology	VO	1,5
*Biology and Cultivation of fungi**		4
Viticulture (min. 12 ECTS)		
Physiology and Management of Grapevine	VO	3
Genetic control of secondary metabolites in perennial crop plants	VO	3
World wines and viticulture	VS	3
Viticulture and Pomology Journal Club	SE	3
Wellbeing Plants & Organic Horticulture (min. 6 ECTS)		
Floriculture	VS	3
Organic fruit growing and viticulture	VX	3
Organic production of Vegetables and Ornamentals	VX	3
Ecological Plant protection	VU	3
Rhizosphere Processes and Application to Agriculture and Soil Protection	VO	3
Ecological basis of Biological control	VO	3

*This course is offered by Corvinus University via web-based learning.

The course list of the Methodological Courses in the Cluster Topic "From Genes to Plants" – TUM/HUB, and the Specialization Courses in the Cluster Topics "Control and Optimization of Horticultural Systems" – TUM/HUB, "Sustainable systems in Mediterranean and tropical horticulture" – AGROCAMPUS/SUPAGRO and "Sustainable fruit production" – UNIBO/FUB are attached in Annex B.

§ 6 MASTER'S THESIS

A master's thesis is a paper on a scientific topic, to be written as part of a master's degree programme (for exceptions please see the By Laws (Satzung) of the University of Natural Resources and Life Sciences, Vienna, part III- Teaching, § 30[9]). The thesis is worth a total of 30 ECTS credits. With their master's thesis, students demonstrate their ability to independently address a scientific topic, both thematically and methodologically (§ 51 [8] UG 2002 BGBl. I no. 81/2009).

The topic of a master's thesis shall be chosen in such a way that it is reasonable to expect a student to be able to complete it within six months. Multiple students may jointly address a topic, provided that the performance of individual students can be assessed (§ 81 [2] UG 2002 BGBl. I no. 81/2009).

The master's thesis shall be written in English. Languages other than English are permissible only if approved and confirmed by the thesis supervisors. The thesis defence must be held in English regardless of the language of the thesis.

The master's thesis is 30 ECTS credits and is supervised by a competent professional person at the chosen university within the IMaHS network. A co-supervision by a second competent professional person at a cooperating university is recommended.

§ 7 COMPLETION OF THE MASTER'S PROGRAMME

The master's programme in "International Master in Horticultural Sciences" has been completed when the student has passed all required courses and received a positive grade on the master's thesis and defence examination.

§ 8 ACADEMIC DEGREE

Graduates of the master's programme in "International Master in Horticultural Sciences" are awarded the academic degree "Master of Science", abbreviated as "MSc" or "M.Sc." by the first supervisor's home university. The academic degree MSc (M.Sc.) shall follow the bearer's name (§ 88 [2] UG 2002 BGBl. I no. 81/2009).

§ 9 EXAMINATION REGULATIONS

(1) Examination regulations of the university where the exam was taken are applicable.

(2) The master's programme in "International Master in Horticultural Sciences" has been completed successfully when the following requirements (corresponds to components in [8] below) have been met:

- positive completion of the compulsory courses worth a total of 30 ECTS credits (§ 4);
- positive completion of the elective courses worth a total of 60 ECTS credits (§ 5);
- a positive grade on the master's thesis and the defence examination.

(3) Student evaluation takes the form of course and module examinations. Course examinations can be either written or oral, as determined by the course instructor, taking the ECTS credit value of the course into account. Any prerequisites for admission to examinations shall be listed in § 4 under the respective course/module.

(4) Student evaluation in modules: Module evaluation is based on the grades given the students in the individual courses that make up the module. The total evaluation for the module is calculated as the average of the grades of all module courses, weighted by ECTS credits. Average values of .5 or lower are rounded to the better (numerically lower) grade; values of over .5 are rounded to the worse (numerically higher) grade. If deemed necessary, the Dean of Students may require a module examination at his/her discretion.

(5) The choice of examination method shall be based on the type of course: Lectures shall conclude with a written or oral examination, if continuous assessment of student performance is not applied. Seminars (SE) and project-based courses (PJ) can be evaluated based on independently written papers, length and contents of which are determined by the course instructor. For all other course types, the examination type is at the instructor's discretion.

(6) The topic of the master's thesis shall be selected from one of the subjects of the master's programme.

(7) After the successful completion of all the courses and examinations required in the master's programme, the completed master's thesis, after it has been given a positive evaluation by the thesis supervisor, shall be publically presented by the student and defended in the form of an academic discussion (defence examination). The committee shall consist of a committee chair and two additional university teachers with a venia docendi or equivalent qualification. The student's total performance (thesis and defence examination) will be assigned a comprehensive grade. Both thesis and defence examination must receive a passing grade for the student to complete the programme. The written evaluations stating the rationale for the thesis grade and the defence examination grade are included in calculating the comprehensive grade and are documented separately.

The comprehensive grade is calculated as follows:

- Master's thesis: 70%
- Defence examination (incl. presentation): 30%

(8) A comprehensive evaluation of the student's performance on the entire programme shall be assigned. A comprehensive evaluation of "passed" means that each individual component of the programme was completed successfully. If individual components of the programme have not been successfully completed, the comprehensive evaluation is "failed". A comprehensive evaluation of "passed with honours" is granted if the student has received no grade worse than a 2 (good) on all individual components, and if at least 50% of the individual components were graded with 1 (excellent).

§ 10 TRANSITIONAL PROVISIONS

(1) Students who are subject to the master curriculum Horticultural Sciences (H 454, version October 1, 2011) that was in action to date, are entitled to complete their study programme until November 30, 2017.

(2) For those students who are repositioned to this master´s programme after the transitional period or who voluntarily change to this master´s programme, examinations for courses

taken under the provisions of the previously valid curriculum shall be recognized towards the new programme under the provisions of this curriculum based on the list of equivalent courses.

§ 11 EFFECTIVE DATE

This curriculum shall take effect on October 1st, 2014.

ANNEX A TYPES OF COURSES

The following types of courses are available:
(Please only offer course types included in this list from now on.)

Lecture (VO)
Lectures are courses in which certain areas of a subject and the methods used in this area are imparted through didactic presentation.

Exercise course (UE)
Exercise courses are courses in which students are instructed in specific practical skills, based on theoretical knowledge.

Practical course (PR)
Practical courses are classes in which students deal with specific topics independently, based on previously acquired theoretical and practical knowledge.

Compulsory internship seminar (PP)
The compulsory internship seminar is a class in which students deal independently with topics related to their internship placements, based on previously acquired theoretical and practical knowledge.

Seminar (SE)
Seminars are courses in which students are required to work independently on the respective subject, deepen their knowledge of the topic and discuss relevant issues.

Field trips (EX)
Field trips are courses in which students have the opportunity to experience relevant fields of study in real-life practical application, to deepen their knowledge of the respective subject. Field trips can be taken to destinations both in Austria and abroad.

Master thesis seminar (MA)
Master thesis seminars are seminars intended to provide students with academic support during the thesis writing process.

Mixed-type courses:
Mixed-type courses combine the characteristics of the courses named above (with the exception of project-type courses). Integration of different course-type elements improved the didactic value of these courses.

Lecture and seminar (VS)
Lecture and exercise (VU)
Lecture and field trip (VX)

Project course (PJ)
Project courses are characterized by problem-based learning. Under instruction, students work - preferably in small groups - on case studies, applying appropriate scientific methods.

Seminar and field trip (SX)
Exercise and seminar (US)
Exercise and field trip (UX)

ANNEX B COURSES OF CONSORTIA MEMBER

1. Basic courses

Semester/Cluster Topic - Basic Courses COR course title	Course type	ECTS credits
Ecosystem and Plant Physiology		
Plant physiology and plant molecular biology	-	3
Geobotany and plant ecology	-	3
Advanced Plant Pathology		
Biological bases of plant pathology	-	3
Biological bases of entomology	-	3
Managing Crop Growth, Yield and Quality		
Decision support systems of extension service	-	3
Modern systems in production and commerce of ornamentals	-	4
Special technical knowledge	-	3
Horticultural Economics		
Agrarmanagement	-	3
Agrarian law and law in economic life	-	3

Semester/Cluster Topic - Basic Courses TUM course title	Course type	ECTS credits
Ecosystem and Plant Physiology		
Technical Procedures and Principles of Protected Cultivation	-	5
Advanced Plant Pathology		
Crop biotechnology	-	5
Managing Crop Growth, Yield and Quality		
Crop Physiology: Growth and Development of Plants	-	5
Crop Quality: Basics of Quality Control and Assurance	-	5
Horticultural Economics		
Research Methods and Economics Research Project	-	5

Semester/Cluster Topic - Basic Courses UNIBO course title	Course type	ECTS credits
Ecosystem and Plant Physiology		
Ecophysiology of horticultural crops	-	3
Crop ecosystems	-	3
Advanced Plant Pathology		
Plant and Pathogens	-	3
Applied Entomology	-	3
Managing Crop Growth, Yield and Quality		
Managing yield and quality in fruit trees and horticultural crops	-	3
Manipulating plant biotic interactions to increasing productivity	-	3

Vegetable crops	-	3
Horticultural Economics		
Agrifood Marketing	-	3
Measuring management performance	-	3

2. Methodological courses

Cluster Topic "From Plant to Genes" COR	**Course type**	**ECTS credits**
course title		
Crop Biotechnology (Classical & Molecular Approaches) (min. 6 ECTS)		
Molecular genetics and gene technology of plants	-	3
Propagation biology of plants	-	3
Research and Evaluation methods in Horticultural Economics (min. 6 ECTS)		
NN (equivalent to "Methods of measuring Stress resistance in Plants")	-	3
NN (equivalent to "Developmental Genetics of Plants")	-	3
System Analysis as a Research Method (min. 6 ECTS)		
Production ecosystems and forms of their regulation	-	3
Information systems in horticulture	-	3
NN (equivalent to "Interdisciplinary project in organic horticulture, fruit growing and viticulture")	-	3
NN (equivalent to "Plant molecular breeding to meet the challenges posed by climate change")	-	3
Environmental-friendly Horticulture (min. 6 ECTS)		
Natural resources and nature protection	-	3
Biological pest management	-	3
Organic farming	-	3
Bioactive Plant Compounds (min. 6 ECTS)		
Biologically active substances in horticultural species	-	2
Evaluation of fruit cultivars	-	4
Special plant compounds in nutrition and therapy	-	3
NN (equivalent to "Methods in horticultural physiology")	-	3

Semester Topic - Methodological Courses	**Course type**	**ECTS credits**
Cluster Topic "From Genes to Plant" TUM/HUB		
course title		
Crop Biotechnology (Classical & Molecular Approaches)*		
Plant Biotechnology	-	5
Biotechnology in Horticulture I	-	5
Biotechnology in Horticulture II	-	5
System Analysis as a Research Method*		
Methods of Monitoring and Evalua-tion of Technical Processes in Horti-culture	-	5
Plant Nutrition in Environmantal-friendly Horticultural Systems	-	5

Systems Analysis as a Research Method	-	5
Plant Physiology and Analytical Chemistry		
Physiology of Woody Plants and Applied Dendrology	-	5
Analysis of Bioactive Compounds in Fruits and Vegetables	-	5
Research Project ‘Plant Growth Regulation’	-	10
Control and Evaluation Methods		
Food Chain Management	-	5
Genetic and Environmental Control of Vegetal Crops	-	5
Sustainability: Paradigms, Indicators, and Measurement Systems	-	5
Research and Evaluation Methods in Horticultural Economics		
Research Methods and Economics Research Project	-	5
Optional Courses		
Applications of Evolutionary Theo-ry in Agriculture	-	5
Biology and Physiology of Plant Stress	-	5
Control and Optimization of Secondary Plant Metabolites	-	5
Methods in Woody Plant Pathology	-	5
Quantitative Genetics and Selection	-	5
Plant Biotechnology	-	5
Project Management in Molecular Plant Biotechnology	-	5
Research and Science Management	-	5
Research Project ‘Biotechnology of Horticultural Crops’	-	10
Research Project ‘Chemical Genetics’	-	10
Research Project ‘Plant Growth Regulation’	-	10
Research Project ‘Plant Pathology '	-	10
Research Project ‘Secondary Plant Metabolites’	-	10

3. Specialization courses

Cluster Topic "Control and Optimization of Horticultural Systems" TUM/HUB	**Course type**	**ECTS credits**
course title		
Horticulture Engineering and Economy (min. 12 ECTS)		
Ecophysiological basics of urban horticulture	-	
Environmental Management and Information Systems	-	
Development of New Floricultural Products		
Information and Communication Technology in Horticulture	-	
Human Resource Management for Agriculture and Related Industries	-	5
Biotechnology and Plant Growth Regulation		
Biology of Generative Propagation in Horticulture	-	
Plant Molecular Physiology - Environmental Impact on Photosynthe-sis and Abiotic Stress Response	-	
Research Project ‘Biotechnology of Horticultural Crops’	-	10
Research Project ‘Chemical Genetics’	-	10

Production Process Design and Quality Management		
Crop Quality Assessment	-	
Plant Disease and Control Management	-	
Post-harvest Quality and Stored Product Protection		
Horticultural Outdoor Plant Systems	-	
Crop Quality: Basics of Quality Control and Assurance		5
Secondary Plant Metabolites and Human Health	-	5
Optional Courses		
Analysis of Bioactive Compounds in Fruits and Vegetables	-	5
Biotechnology in Horticulture I	-	5
Evolutionary Genetics of Plants and Microorganisms	-	5
Host-Parasite-Interaction	-	5
Marker-assisted selection	-	5
Methods in Woody Plant Pathology	-	5
Model Systems and Crop Quality	-	5
Plant Biotechnology	-	5
Project Administration, Documentation and Publication	-	5
Project Management in Molecular Plant Biotechnology	-	5
Research Project ‘Plant Growth Regulation’	-	10
Research Project ‘Plant Pathology'	-	10
Systems Analysis as a Research Method	-	5

Cluster Topic "Sustainable systems in Mediterranean and tropical horticulture" SUPAGRO/AGROCAMPUS	**Course type**	**ECTS credits**
course title		
Knowing the International Horticultural Context and Meeting the Industry Challenges*		
Context and stakes of Mediterranean and tropical horticultural chains	-	3
Improvement of a Mediterranean or tropical horticultural chain	-	4
Developing the Systems Approach to Design and Manage Sustainable Horticultural Production in Tropical or Mediterranean Contexts*		
Analysis, design and evaluation of ecologically innovative horticultural systems for Mediterranean or tropical areas	-	3
Systems approach applied to peri-urban horticulture and protected crops in southern countries	-	3
Integrated pest and disease management for tropical horticultural crops		3
Improving and Disseminating an Efficient and Adaptaed Plant Material*		
Diversity, selection and variety improvement for Mediterranean or tropical horticulture	-	3
Quality seeds and transplants for Mediterraneanortropical crops	-	3
Performance of the seed and transplant chain organization for southern countries		2

Optional Courses		
Construction, evaluation and improvement of the quality of Mediterranean and tropical fruits & vegetables	-	3
Storage and processing of Mediterranean and tropical fruits & vegetables	-	3
Advanced statistics and data treatment	-	3

Cluster Topic "Sustainable fruit production" UNIBO/FUB	**Course type**	**ECTS credits**
course title		
Nursery and Orchard Management (min. 6 ECTS)		
Nurseries and orchards Design	-	3
Fertilization and Plant Nutrition	-	3
Mechanization, Ergonomics and safety of spraying machines	-	6
Sustainable production chain*		
Advanced entomology	-	2
Post-harvest management	-	3
Advanced Plant Protection	-	2
Breeding for Sustainable Production	-	2
Fruit Marketing and Policy*		
Fruit market analysis and consumer behaviour	-	3
Agricultural policies evaluation	-	3
Fruit processing	-	3
Optional Courses (min. 6 ECTS)		
Advanced techniques applied to grape	-	6
ecology of insect populations	-	3
organic fruit production	-	3
Soil fertility	-	3
Fruit Tree Physiology	-	3
Plant-Probiotic Microorganisms: the basis of sustainable agriculture	-	3
Farm Information Technologies for Fruit Science	-	3
Fruit cultivation in mountain areas	-	3