International Master of Science in Horticulture

joint degree program among universities:

MENDEL UNIVERSITY IN BRNO, FACULTY OF HORTICULTURE

UNIVERSITY OF AGRICULTURE IN KRAKOW, FACULTY OF HORTICULTURE

SLOVAK UNIVERSITY OF AGRICULTURE IN NITRA, FACULTY OF HORTICULTURE AND LANDSCAPE ENGENEERING

THE CURRICULUM OF COURSES

March, 2014

CONTENTS

1. Title of unit/subject/module		**Horticultural Machinery**							
2. Unit code			**3. Number of ECTS credits**		**5**				
4. Contact hours		**Total 56**	**L 28**		**E 28**		**S**		**Other forms**
5. Cycle	**Master´s**	**6. Year**	**1**		**7. Semester**		**2nd**		
8. Study programme		**elective**			**9. Branch of study**				
10. Pillar of the programme		**International Master of Science in Horticulture**			**11. Language**		**English**		
12. Special features									

13. Objectives and subject-specific competences	To acquaint students with fruit growing and the range of machinery used in the conditions prevailing in CR. The use, maintenance and repair of machines for various operations, such as cultivations, crop protection and harvesting, are studied.	
14. Description of content	Fruit-growing techniques, production processes, working operations, technical procedures, appropriate techniques for soil management systems, tractors, machines for working the soil (cultivations, hydraulic swinging sections), machines for mulching and mowing grass, spreaders, sprayers, front-fitted knife trimmers, harvesting machines, transporting equipment, working costs of machines, development trends	
15. Basic bibliography	**ZEMÁNEK, P; BURG, P.** : *Speciální mechanizace-mechanizační prostředky pro vinohradnictví.* 1.vyd. Brno: MZLU v Brně, 2003. 98 s. ISBN 80-7157-739-1 **WALG, O.***: Taschenbuch der Weinbautechnik.* 1. Auflage. Kaiserlautern: Rohr-Druck, 2000. 432 s. ISBN 3-921156-45-9 **SKROCH, W.A.:** Orchard floor management – an overview. HortScience 21 (3), 390 -94 **ROBSON, A.D.:** Soil Acidity and Plant Growth, Academic Press, Sydney **KAY, R.D., EDWARDS W.M.:** *Farm Management.* 1st ed., vol. 2. Texas University a Iowa State University, 1994. 433 s. ISBN 0-07-033868-X. **COOMBE, B.G., DRY, P.R.** *Viticulture.* 4th ed., vol. 2. South Australia: Hyde Park Press, Adelaide, 1993. p. 340. ISBN 1 875130 01 2 **ZEMÁNEK, P, BURG, P.:** *Vinohradnická mechanizace – stroje pro chemickou ochranu.* Brno: MZLU v Brně, skriptum, 2007. 1. vyd., 80 s. ISBN 978-80-7375-123-4	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	partitioning resources and efficient use of machinery, technical solutions and economic considerations in the area of fruit growing.

	16.2 Application	This knowledge can be used to build and maintain mechanical production lines, improve production processes and appropriate use machines.
	16.3 Reflection	The efficient exploitation of machinery in horticultural processes.
	16.4 Transferable skills – not tied to just one subject	The preparation and presentation of seminar work, use of domestic and foreign literature and other information resources has general application. A knowledge and understanding of machinery and mechanization has application throughout industry.
17. Methods of teaching and learning	Lectures, seminars, excursion.	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course	
19. Methods of assessment and the assessment scale	Written exam (80%), oral exam (20%) Evaluation scale: Grades from A (best) to F (worst).	
20. Method of evaluation of quality	Institutional self-evaluation by students	
21. Curriculum compiler	Prof.Ing. Pavel Zemánek, Ph.D; MENDELU, Faculty of Horticulture in Lednice E-mail: pavel.zemanek@mendelu.cz	

1. Title of subject/module/unit				**Technology of Fruit Distillates**							
2. Unit code				**3. Number of ECTS credits**				**4**			
4. Contact hours		**Total 28**		**L 14**		**E 14**		**S 0**		**Other forms**	
5. Cycle	**Master´s**	**6. Year**		**1st**	**7. Semester**		**2nd**				
8. Study programme		**International Master of Science in Horticulture**			**9. Branch of study**						
10. Pillar of the programme		**elective**			**11. Language**		**English**				
12. Special features											

13. Objectives and subject-specific competences	Students will study the basic processes and practical methods used on producing fruit distillates. Students will master the principles of preparation of fruit mash and fermentation control, about principles of distillation and rectification. They will also learn about adjustments and ageing of distillates, their sensory evaluations and specific procedures of producing some kinds of distilled spirits.	
14. Description of content	Qualitative parameters of fruit species for fermentation. Principles of preparation of fruit mash. Methods of fermentation control. Technology of production of distillates from starch raw materials. Principles of distillation and rectification. Methods of distillation and rectification. Chemical composition of distillation fractions. Adjustments and ageing of fruit distillates. Defects of fruit distillates and their elimination. Quality requirements and evaluation of distilled spirits.	
15. Basic references	Bryce, J.H., Stewart, G.G. (2003): Distilled Spirits. Nottingham University Press, ISBN: 1897676395. Wakely, J., Brother, L. (2001): The international spirits industry. Woodhead Publishing, Limited, ISBN 1 85573 511 3. Hui, Y.H. et al. (2004): Handbook of Food and Beverage Fermentation Technology. Marcel Dekker Inc., ISBN: 0824747801.	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	During this course, students will learn about the technology of fruit distillates, principles of fermentation control of fruit mashes, and about distillation and rectification processes. They will be also informed about quality parameters of selected kinds of distilled spirits.

	16.2 Application	Through a combination of lectures, seminars, and excursions the students will be able to obtain the required knowledge of principles of distillation processes and production of fruit distillates.
	16.3 Reflection	This knowledge will be thereafter applied to elaborate essays about the technology of production of some kinds of fruit distillates.
	16.4 Transferable skills – not tied to just one subject	During an excursion to a distillery the students will become familiar with practical technological methods of production of fruit distillates as well as with possibilities of working in this branch of food industry.
17. Methods of teaching and learning	Lectures, seminars, essays, and excursion to a distillery.	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course. Prerequisite is a basic course in fruit processing.	
19. Methods of assessment and the assessment scale	Oral examination (90%), seminar papers (10%) Evaluation scale: Grades from A (best) to F (worst).	
20. Method of evaluation of quality	Student questionnaire.	
21. Curriculum compiler	Ass. Prof. Ing. Josef Balík, Ph.D.; MENDELU, Faculty of Horticulture in Lednice	

1. Title of subject/module/unit				**Fruit storage**					
2. Unit code				**3. Number of ECTS credits**			**6**		
4. Contact hours		**Total 56**		**L 28**	**E 22**		**S 6**		**Other forms**
5. Cycle	**Master´s**	**6. Year**	**1st**	**7. Semester**		**2nd**			
8. Study programme		**International Master of Science in Horticulture**		**9. Branch of study**					
10. Pillar of the programme		**Compulsory**		**11. Language**		**English**			
12. Special features									

13. Objectives and subject-specific competences	Students will study the basic principles of post-harvest physiology in fresh fruit. This knowledge of post-harvest biology and related technology will be applied in practical training in storehouses and packing centres. Practical work during lab excercises will give students an insight into the various processes involved, leading to a better understanding of the issues surrounding fruit quality.
14. Description of content	Biological factors involved in deterioration, such as respiration and ethylene production, compositional changes during growth and development, and ripening stages in stores with different temperature and humidity regimes. Physical damage is a major contributor to deterioration. Post-harvest processes are assessed according to their temperature-management procedures and control of relative humidity, including the storage systems themselves. Controlled-atmosphere storage systems, which can be very varied, will be studied in detail. All aspects of the cold-storage and handling of fruit, from preserving high quality (by suppressing disease and slowing down metabolic processes) to safety issues, will be studied.
15. Basic references	Kader, A. A. (1992) Post-harvest Technology of Horticultural Crops. University of California, 291pp. ISBN 0-93176-99-0 Tijskens, L. M. M., Hertog, M.L.A.T.M. and Nicolai, B.M. (2001) Food Process Modelling. Woodhead Publishing Limited, Abington Hall, Abington, Cambridge CB1 6AH. ISBN 0-8493-1224-8 Bottcher, H. (1996) Frishhaltung und Lagerung von Gemüse. Ulmer Verlag, Stuttgart,251 pp. ISBN 3-8001-5825-2

16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	Understanding the physiology and biochemistry of ripening is the basis of post-harvest technology. Basic principles of using gas mixtures for fruit and vegetable storage will be studied. Students will acquire a basic knowledge of fruit chemistry and an overview of the quality issues surrounding storing fresh fruit.
	16.2 Application	Lab work will give students a knowledge of the underlying physiological processes involved in ripening, softening and the basic changes in metabolites. They will understand how storage regimes are managed commercially.
	16.3 Reflection	Theoretical knowledge and hands-on experiments will give students a better understanding of changes in living fruit and the factors limiting post-harvest storage, as demonstrated by physiological diseases and microbial spoilage.
	16.4 Transferable skills – not tied to just one subject	This knowledge of biochemistry, microbiology and storage systems for fruit, and the quality issues involved in handling and storage, has general application throughout the food industry.
17. Methods of teaching and learning	Lectures, laboratory practicals and visits to storage factories.	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course. Pre-requisite is a basic course in chemistry and plant physiology or fruit conservation.	
19. Methods of assessment and the assessment scale	- Written exam (30%), oral exam (60%) - Attendance at laboratory practicals and preparation of laboratory reports (10%) Evaluation scale: Grades from A (best) to F (worst).	
20. Method of evaluation of quality	Student questionnaire.	
21. Curriculum compiler	Prof. Dr. Jan Goliáš; MENDELU, Faculty of Horticulture in Lednice	

1. Title of unit/subject/module			**Stone fruit production**					
2. Unit code			**3. Number of ECTS credits**		**6**			
4. Contact hours		**Total 56**	**L 28**	**E 28**	**S 0**	**Other forms**		
5. Cycle	**Master´s**	**6. Year**	**1st**	**7. Semester**	**2nd**			
8. Study programme	**International Master of Science in Horticulture**		**9. Branch of study**					
10. Pillar of the programme	**compulsory**		**11. Language**	**English**				
12. Special features								

13. Objectives and subject-specific competences	Students will be taught the basic principles of growing stone fruits, enabling them to subsequently work on commercial fruit farms, in government institutions or in specialised teaching establishments. This course covers cultivation techniques and training systems for stone fruits, and new developments both in the Czech Republic and abroad. This includes: required growing conditions, pruning and modern training systems, commercially popular varieties and promising new varieties, harvesting and the major pests and diseases.
14. Description of content	This course covers cultivation techniques and training systems for stone fruit production: - current situation in apricot, peach, sweet and sour cherries and plum production world-wide - basic conditions required - main breeding goals for stone fruits - flowering, pollination and fertilisation of stone fruits - pruning (effect of apical dominance, growth rate of tree) - fruit thinning (fruit set, fruit drop, biennial cropping and fruit quality) - stone fruit varieties (domestic and international developments) - modern training systems, requirements for establishing new plantations, characteristics of different training systems - fruit classification - main pest and diseases
15. Basic bibliography	**JACKSON, David I**: Temperate and subtropical fruit production, Wallingford : CABI Publishing 1999, 332 s , il, ISBN: 0-85199-271-4 **NAKASONE, H. Y - PAULL, R. E:** Tropical fruits, Wallingford : CAB International 1998, 450 s. ISBN: 0-85199-254-4 **BAUGHER, Tara Auxt**: Concise encyclopedia of temperate tree fruit, New York : Food Products Press 2003,387 s ISBN: 1-56022-940-3, 1-56022-941-1 **TROMP, J**: Fundamentals of temperate zone tree fruit production,

	Leiden : Backhuys Publishers c2005, 400 s. , il ISBN: 90-5782-152-4 **JANICK, Jules**: Fruit breeding , Volume I, II, III, New York : John Wiley & Sons 1995, 616 s.:il. ISBN: 0-471-31014-X **DESVIGNES, Jean-claude**: Virus Diseases of Fruit Trees , Diseases due to viroids, viruses, phytoplasmas and other undetermined infectious agents, Paris : CTIFL 1999, 202 s. ISBN: 2-87911-143-9 **KHAN, Jawaid A**: Plant viruses as molecular pathogens, New York : Food Products Press 2002, 537 s.: il. ISBN: 1-56022-895-4 **DESVIGNES, Jean Claude**: Maladies a virus des arbres fruitiers , /Maladies a virus, a mycoplasmes et a viroides, Paris : CTIFL 1990, 126 s. ISBN: 2-901002-78-1	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	Students will be competent to manage stone fruit orchards. and will have up-to-date knowledge of the latest research findings concerning apricots and peaches from the activities of the Dept. of Fruit growing in Lednice.
	16.2 Application	On the basic of their newly-acquired knowledge about stone fruit growing, students will be able to critically evaluate techniques of stone fruit growing and choose the most appropriate for their situation.
	16.3 Reflection	Becausethe Horticultural Faculty in Lednice is situated in the most suitable stone fruit growing area in the Czech Republic, students will be able to meet commercial growers and learn about current developments first-hand.
	16.4 Transferable skills – not tied to just one subject	The ability to critically evaluate different growing techniques and the knowledge of plant physiology can be applied in all horticultural fields.
17. Methods of teaching and learning	Lectures, seminars,field excercise	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course	
19. Methods of assessment and the assessment scale	Totaly 100 points • Written exam (40 points) • Attendance at laboratory practicals (40 points) • Preparation of laboratory report (20 points) Evaluation scale: A-F (A= 91 – 100; B= 81 – 90; C= 71-80; D = 61-70; E = 51- 60; F = lower than 50 points, unsuccefull	
20. Method of evaluation of quality	Institutional self-evaluation by students	
21. Curriculum compiler	MENDELU, Faculty of Horticulture in Lednice; Prof.Dr. Boris Krška, Dipl.Ing. Ivo Ondrášek, Ph.D. E-mail: krska@zf.mendelu.cz	

1. Title of unit/subject/module				**Sophisticated Vegetable Production**					
2. Unit code				**3. Number of ECTS credits**			**5**		
4. Contact hours			**Total 56**	**L 28**		**E 28**	**S**		**Other forms**
5. Cycle	**Master´s**	**6. Year**		**1st**	**7. Semester**		**2nd**		
8. Study programme		**International Master of Science in Horticulture**			**9. Branch of study**				
10. Pillar of the programme		**Elective**			**11. Language**	**English**			
12. Special features									

13. Objectives and subject-specific competences	To acquaint students with individual species of vegetables, including their morphology, growing techniques, harvest methods, marketing, quality standards and available varieties.	
14. Description of content	Botanical characteristics, nutritional quality, growing methods, harvesting, post-harvest processes, grading standards, cultivar assortment of the economically important range of: vegetable fruits (tomatoes, peppers, etc.), legumes, leaf vegetables, brassicas and root and bulb vegetables.	
15. Basic bibliography	BARTOŠ, J. a kol. Pěstování a odbyt zeleniny, Agrospoj Praha, 2000, 286 pp KOTT,L., MORAVEC,J. Pěstování a použití méně známých zelenin, SZN Praha, 1989, 268 pp PETŘÍKOVÁ,K. a kol. Zelenina – pěstování, ekonomika, prodej Nakl. Profi Press, s.r.o., Praha 2006, 240 pp RUBATZKY V., YAMAGUCHI M. World vegetables: principles, production, and nutritive values. Aspen Publication, 1999. 843 pp VOGEL,G.Handbuch des speziellen Gemüsebaues. Eugen Ulmer,Stuttgart, 1996, 1126 pp	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	Students will be able to apply their theoretical knowledge of nutrition, physiology and plant pathology to growing techniques for vegetables.
	16.2 Application	This knowledge can be used on farms in the actual production, and also in marketing, of vegetables.
	16.3 Reflection	This course will increase the ability of our growers to compete in current markets.

	16.4 Transferable skills – not tied to just one subject	The competences here can be applied to any horticultural or agricultural product, whether in production, sales or marketing.
17. Methods of teaching and learning	Lectures, seminars	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course	
19. Methods of assessment and the assessment scale	Totaly 100 points • Written exam (40 points) • Attendance at practicals (40 points) • Preparation of laboratory report (20 points) Evaluation scale: A-F (A= 91 – 100; B= 81 – 90; C= 71-80; D = 61-70; E = 51- 60; F = lower than 50 points, unsuccefull	
20. Method of evaluation of quality	Institutional on-line self-evaluation by students	
21. Curriculum compiler	Assoc.Prof..Ing. Robert Pokluda,Ph.D., e-mail: pokluda@zf.mendelu.cz Phone:+420-519 367 232 MENDELU, Faculty of Horticulture in Lednice	

1. Title of unit/subject/module				**Wine Technology**					
2. Unit code				**3. Number of ECTS credits**			**6**		
4. Contact hours			**Total 56**	**L 28**		**E 28**		**S**	**Other forms**
5. Cycle	**Master´s**	**6. Year**		**1st**	**7. Semester**		**2nd**		
8. Study programme		**International Master of Science in Horticulture**			**9. Branch of study**				
10. Pillar of the programme		**Elective**			**11. Language**		**English**		
12. Special features									

13. Objectives and subject-specific competences	The aim of this course is to inform students about basic winemaking techniques and chemical principles of main processes in viticulture and viniculture. To teach analytical methods for determining the presence of additives in wine alongside the natural compounds found in wine.	
14. Description of content	1.History of viticulture in CR and the rest of the world. 2.Grape and its maturation. 3.Harvest and Pre-Fermentation Treatments 4.Conditions of Yeast Development 5.Biochemistry of Alcoholic Fermentation 6.The Use of Sulfur Dioxide in Must and Wine Treatment 7.Malolactic Fermentation 8.White Winemaking 9.Red Winemaking 10.Evolution of Chemical Compounds in Young Wine	
15. Basic bibliography	Balík,J., Vinařství, laboratorní cvičení, MZLU Brno Clarke,R.J. and Bakker,J, Wine flavour chemistry,Blackwell Publishing lid Oxford, 2004 Farkaš,J., Biotechnológia vína , ALFA Bratislava,1983 Ribéreau-Gayon et.at, Handbook of enology volume1.2 , Paris, 2006 Steidl,R., Sklepní hospodářství, Národní salon vín, Valtice 2002	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	Current scientific progress in the field of winemaking
	16.2 Application	Improved winemaking skills and making better wine.
	16.3 Reflection	Recognizing opportunities for improving technique.
	16.4 Transferable skills – not tied to just one subject	Use of domestic and foreign literature and other information resources. Identifying and solving problems, critical analysis of product defects and possible remedies, critical analysis of literature.
17. Methods of teaching	Lectures and laboratory exercises, excursions	

and learning	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course
19. Methods of assessment and the assessment scale	Totaly 100 points • Written exam (40 points) • Attendance at laboratory practicals (40 points) • Preparation of laboratory report (20 points) Evaluation scale: A-F (A= 91 – 100; B= 81 – 90; C= 71-80; D = 61-70; E = 51- 60; F = lower than 50 points, unsuccefull
20. Method of evaluation of quality	Institutional on-line self-evaluation by students
21. Curriculum compiler	Dr. Mojmír Baroň, e-mail: mojmirbaron@seznam.cz, phone: +420 519 367 252 MENDELU, Faculty of Horticulture in Lednice

1. Title of unit/subject/module				**Aplied Plant Biotechnology**					
2. Unit code				**3. Number of ECTS credits**		**6**			
4. Contact hours		**Total 56**		**L 28**	**E 28**		**S**		**Other forms**
5. Cycle	**Master´s**	**6. Year**	**1st**		**7. Semester**	**2nd**			
8. Study programme		**International Master of Science in Horticulture**			**9. Branch of study**				
10. Pillar of the programme		**Compulsory**			**11. Language**	**English**			
12. Special features									

13. Objectives and subject-specific competences	Main goal of this subject is to acquaint students with basic principles of genetics, instability and changes in plant genomes, plant breeding New biotechnology techniques applied in contemporary genetics will also be introduced.
14. Description of content	The course will cover the following topics: • Introduction to classical and molecular genetics (inheritance, Mendelian rules, mitosis, meiosis, alleles interaction, QTL's, genes linkage) • Molecular principles of inheritance (structure and function of DNA, DNA replication, recombination) • Gene function (genetic code, transcription, translation, proteins: structure and function) • Genes and genome structure (eukaryotic chromosomes, gene regulation, gene interactions; linkage and linkage maps) • Instability and changes in plant genomes (mutations of genes, induction and detection of mutations, repairing process, mutations of genomes, polyploidy, aneuploids, haploids, transpozon elements) • Genetic and phenotypic variation (population genetics, Hardy – Weinberger equilibrium) • Principles of basic plant breeding approaches • Genetics of pest and disease resistance • Biotechnological tools and methods used in plant breeding (PCR, RT-PCR, Real Time PCR, methods for determination of genome size and its variability, cultivar identification, marker assisted selection)
15. Basic bibliography	Urban, T., Vyhnánek, T. *Virtuální svět genetiky 1. Tištěná forma multimediálního hypertextu na CD.* 1. vyd. Brno: MZLU, 2(ISBN 80-7157-613-1. Chloupek, O. *Genetická diverzita, Šlechtění a semenářství* Academia Praha 1995 Hraška, Š. a kol. *Genetika rastlin* Príroda Bratislava 1990 Kováčik, A. a kol. *Genetika rostlin* - 1983 George Acquaah *Principles of Plant Genetics and Breeding*, Blackwell Publishing, Incorporated; 1st edition (September 27, 2006)

	Dominique De Vienne. *Molecular Markers in Plant Genetics and Biotechnology*, Science Publishers (February 2003)	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	• Gain profound knowledge about classical and molecular plant genetics • Develop an understanding of the advanced applications of genetic and biotechnological techniques for breeding goals and genetic analysis of plants.
	16.2 Application	Based on the understanding of principles of modern plant breeding and biotechnological methods students will be able to implement innovative plant breeding programs in the practice.
	16.3 Reflection	Significantly reflect recent trends in the area of new breeding and biotechnological techniques in the field of agriculture.
	16.4 Transferable skills – not tied to just one subject	• Improve skills in the use of accessible scientific informations by applying various interactive searching tools • Impair writing abilities by compiling a seminar works • Able to understand and explain to growers potential for using of modern biotechnology and breeding approaches.
17. Methods of teaching and learning	lessons + seminars, individual assignments, workshop	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course Students should attend in parallel: Biotechnology in Horticulture - Laboratory Exercises	
19. Methods of assessment and the assessment scale	final written test and oral exam, evaluated presentation during workshop	
20. Method of evaluation of quality	ECTS system	
21. Curriculum compiler	Dr. Miroslav Baránek, MENDELU, Faculty of Horticulture in Lednice	

1. Title of subject/module/unit			**Biostatistics**					
2. Unit code			**3. Number of ECTS credits**		**6**			
4. Contact hours		**Total 48**	**L 18**		**E 24**	**S 6**		**Other forms**
5. Cycle	**Master´s**	**6. Year**	**1st**	**7. Semester**		**1st**		
8. Study programme	**International Master of Science in Horticulture**			**9. Branch of study**				
10. Pillar of the programme	**Compulsory**			**11. Language**	**English**			
12. Special features								

13. Objectives and subject-specific competences	Knowledge about experimental design and basic statistical approaches to analyze data collected from experiments and how to handle the data using computer software. Student will learn statistical functions built in Excel and in dedicated software, various procedures of data management and interpretation of the results.	
14. Description of content	Principles of data management, descriptive statistics, measures of variation, experimental design, experimental errors, hypothesis testing, methods of variate comparison, analysis of variance, regression, correlation, non-parametric test, exploratory techniques.	
15. Basic bibliography	Electronic Statistical Textbook, Statsoft: http://www.statsoft.com/textbook/ University of Reading Statistical Service Centre: http://www.reading.ac.uk/ssc	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	The student knows methods of data description, available methods of data analysis for comparison purposes, basic exploratory techniques, principles of experimental design.
	16.2 Application	The student applies rules of data management and presentation, designs experiments, uses the appropriate statistical methods for data analysis.
	16.3 Reflection	The student is capable of formulating statistical hypotheses, interpreting the output of statistical analyses.
	16.4 Transferable skills – not tied to just one subject	Teamwork, ability to write reports and present them to the public.
17. Methods of teaching and learning	Lectures and practicals with computers.	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course. Basic computer skills.	
19. Methods of assessment and the assessment scale	- Written exam (40%) - Attendance at laboratory practicals and preparation of laboratory Reports (40%) - homeworks (20%) Evaluation scale: Grades from 2.0 (worst) to 5.0 (best)	
20. Method of evaluation of course quality	Student questionnaire	
21. Curriculum compiler	Dr. Rafal Baranski, University of Agriculture in Krakow	

1. Title of subject/module/unit				**Integrated Protection of Horticultural Crops**					
2. Unit code				**3. Number of ECTS credits**			**7**		
4. Contact hours		**Total**		**L**	**E**		**S**		**Other forms**
		56		**24**	**24**		**8**		
5. Cycle	**Master´s**	**6. Year**	**1st**		**7. Semester**		**1st**		
8. Study programme		**International Master of Science in Horticulture**			**9. Branch of study**				
10. Pillar of the programme		**Compulsory**			**11. Language**		**English**		
12. Special features									

13. Objectives and subject-specific competences	Identification of the most important diseases and insects agents occurring in horticulture crop plants (vegetables, orchards). Introduction of vegetable and orchard programmes for integrated plant protection (IPM systems). Principles of using chemical protection in IPM.
14. Description of content	Getting to know with the occurrence, harmfulness and economically important pests and diseases in integrated production systems and discusses how prevent and control them.
15. Basic bibliography	Agrios G. N.: Plant Pathology. Academic Press. San Diego, London, Boston, N. York, Sydney. Tokyo, Toronto 1997, ss. 635. Snowdon A. L.: Post-Harvest Diseases and Disorders of Fruits and Vegetables. Vol. 1: General Introduction and Fruits. Wolfe Scientific Ltd. London 1990, ss. 302. Vol. 2: Vegetables. Wolfe Scientific Ltd. London 1990, ss. 416. Learning Plant Pathology. The Plant Health Instructor. American Phytopathological Society, 2006. www.apsnet.org/education. Peshin, Rajinder; Dhawan, Ashok K. (Eds.). **Integrated Pest Management**. Volume 1. 2009 D.P. Abrol., U. Shankar. **Integrated Pest Management:** Principles and Practice. CABI, 2012 - Electronic books – 512 pp.

16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	Examines methods and techniques of plant protection, has knowledge in the selection of the appropriate pesticides. It has the ability to associate elements of biology and the development of pests and pathogens to the proper selection of monitoring methods and the selection of the most favorable techniques for the prevention and control of pests and pathogens from the point of view of integrated pest.
	16.2 Application	Draws up a programs to protect fruit and vegetable crops from diseases and pests. Identifies pathogens and pests, the symptoms of disease and injury and beneficial organisms present in the fruit and vegetable crops. Knows how to properly use the right equipment used for forecasting and monitoring of pathogens (signaling plots) and pests (pheromone, sticky and volatile traps).
	16.3 Reflection	The student is capable of formulating opinions on the use of integrated pest management in crop improvement.
	16.4 Transferable skills – not tied to just one subject	Teamwork, ability to present and defend personal opinions.
17. Methods of teaching and learning	Lectures, laboratory practicals, field practicals	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course. Pre-requisite is a basic course in biology of insect and bacteria and fungi science. Basic computer skills.	
19. Methods of assessment and the assessment scale	- Oral presentation (40%) - Attendance at laboratory practicals and preparation of laboratory (40%) - Reports (20%) Evaluation scale: Grades from 2.0 (worst) to 5.0 (best)	
20. Method of evaluation of course quality	Student questionnaire.	
21. Curriculum compiler	Dr hab. Jacek Nawrocki, University of Agriculture in Krakow Dr. Maria Pobożniak, University of Agriculture in Krakow	

1. Title of subject/module/unit				**Plant Molecular Genetics and Genomics**				
2. Unit code				**3. Number of ECTS credits**		**7**		
4. Contact hours		**Total 56**		**L 24**	**E 24**	**S 8**		**Other forms**
5. Cycle	**Master´s**	**6. Year**	**1st**		**7. Semester**	**1st**		
8. Study programme		**International Master of Science in Horticulture**			**9. Branch of study**			
10. Pillar of the programme		**Compulsory**			**11. Language**	**English**		
12. Special features								

13. Objectives and subject-specific competences	Knowledge on structure and function of plant genomes, *Arabidopsis thaliana* as a model plant genome, experimental methods of genome analysis, genome evolution, comparative genomics, practical applications of plant molecular genetics and genomics.	
14. Description of content	Structural, functional, and comparative genomics, genetic mapping and association mapping of plant genomes, whole genome sequencing – methods and perspectives, structure of plant genomes, repetitive DNA – origin and function, mechanisms of genome evolution, comparative genomics, functional genomics, gene expression and its regulation, molecular basis of genetic variation, plant organelle genetics, methods for global gene expression analysis, molecular assessment of genetic diversity, genomics-assisted crop improvement	
15. Basic bibliografy	Lankenau D-H, Volff J-N (eds.), 2009. Transposons and the Dynamic Genome. Springer, Dordrecht. Meksem K, Kahl G (eds.), 2005. The Handbook of Plant Genome Mapping. Wiley-VCH, Weinheim. Sensen CW (ed.), 2005. Handbook of Genome Research. Wiley-VCH, Weinheim, vol. 1 and 2. The Arabidopsis Genome Initiative, 2000. Analysis of the genome sequence of the flowering plant *Arabidopsis thaliana*. Nature 408: 796-815. Varshney RK, Tuberosa R (eds.), 2007. Genomics-Assisted Crop Improvement. Springer, Dordrecht, vol. 1 and 2. Krebs J.E., Goldstein E.S, Kilpatrick S.T. (2011) Lewin's Genes X. 10th Ed. Jones and Bartlett Publishers. Trends in Plant Science – Cell Press.	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	The student defines the scope of molecular genetics and genomics, describes structure of the eukaryotic genome, presents strategies and techniques of genome sequencing and annotation, presents basic issues on genome evolution, describes genomics-based approaches to crop improvement**.**
	16.2 Application	The student applies basic bioinformatic tools for the analysis of DNA sequence, interprets results of bioinformatic analyses, uses online resources and reports results.
	16.3 Reflection	The student is capable of formulating unbiased opinions on the use of molecular genetics and genomics in crop improvement.

	16.4 Transferable skills – not tied to just one subject	Teamwork, ability to present and defend personal opinions.
17. Methods of teaching and learning	Lectures, laboratory practicals and seminars.	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course. Pre-requisite is a basic course in genetics and biochemistry. Basic computer skills.	
19. Methods of assessment and the assessment scale	- Written exam (40%) and oral presentation (40%) - Attendance at laboratory practicals and preparation of laboratory reports (20%) Evaluation scale: Grades from 2.0 (worst) to 5.0 (best)	
20. Method of evaluation of course quality	Student questionnaire.	
21. Curriculum compiler	Dr. Dariusz Grzebelus, University of Agriculture in Krakow Dr. Marek Szklarczyk, University of Agriculture in Krakow	

1. Title of subject/module/unit			**Polymers in Horticulture**				
2. Unit code			**3. Number of ECTS credits**		**5**		
4. Contact hours	**Total 40**	**L 15**	**E 15**	**S**	**Other forms Prof. trip 10**		
5. Cycle	**Master´s**	**6. Year**	**1st**	**7. Semester**	**1st**		
8. Study programme	**International Master of Science in Horticulture**		**9. Branch of study**				
10. Pillar of the programme	**Compulsory**		**11. Language**	**English**			
12. Special features							

13. Objectives and subject-specific competences	Polymeric materials methods of application in the production of horticulture plants.	
14. Description of content	Kinds of polymeric materials used as covers in horticulture, production, basic physical characteristic. Biodegradable polymeric materials. Methods of application (mulching, direct covering, tunnels, greenhouses, pots, irrigation, packaging, strings etc.). Microclimatic conditions under covers, influence on the plants growth and yield. Collecting and recycling of polymeric materials used in agriculture. Examples of horticulture plants technology with the polymeric materials.	
15. Basic bibliografy	Lopez J.C., Perez Parra J., Morales M.A. 2010, Plastics in Agriculture, Almeria Papaseit P., Badiola J., Armengol E. 1997, Plastics and Agriculture, Madrid Siwek P. 1996, Osłony z tworzyw sztucznych w przyspieszonej uprawie warzyw, Hortpress, Warszawa Siwek P. 2010, Warzywa pod folią i włókniną, Hortpress, Warszawa	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	The student recognised basic polymeric materials on the form of nonwoven and film, describes their physical characterictic, presents possibility of application of polymeric materials in horticulture, knows technological elements of some horticulture plants cultivation, describes technical aspects of recycling process**.**
	16.2 Application	The student polymeric materials for horticulture, uses p.m. for appropriate horticulture plants, planes technology of cultivation. applies basic tools for the description of
	16.3 Reflection	The student is capable of improving ecologically the cultivation of horticultural crops.
	16.4 Transferable skills – not tied to just one subject	Teamwork, ability to present and defend personal opinions.
17. Methods of teaching and learning	Lectures, exercises and professional trips.	
18. Conditions for inclusion or to undertake	Enrolment in the year of the course. Basic computer skills.	

work required	
19. Methods of assessment and the assessment scale	- Written exam (60%) , recognizing of polymeric materials and their characteristic and application (20%) - Attendance at laboratory practicals and professional trips (20%) Evaluation scale: Grades from 2.0 (worst) to 5.0 (best)
20. Method of evaluation of course quality	Student questionnaire.
21. Curriculum compiler	Dr hab. Piotr Siwek, University of Agriculture in Krakow

1. Title of subject/module/unit				**Principles of Plant Cell and Tissue Cultures**					
2. Unit code				**3. Number of ECTS credits**		**5**			
4. Contact hours		**Total**		**L** **18**	**E** **20**	**S** **2**	**Other forms**		
5. Cycle	**Master´s**	**6. Year**	**1st**	**7. Semester**	**1st**				
8. Study programme		**International Master of Science in Horticulture**		**9. Branch of study**					
10. Pillar of the programme		**Optional**		**11. Language**	**English**				
12. Special features									

13. Objectives and subject-specific competences	To impart knowledge to the students on the various techniques of plant tissue cultures and their role in crop improvement. Valuable hands-on training to those interested in careers in plant breeding and biotechnology.	
14. Description of content	Major concepts and importance of plant tissue cultures, plant hormones, in vitro pollination and fertilization, micropropagation and somatic embryogenesis, haploid production, meristem culture and pathogen-free plants, interspecific crossing and embryo-rescue, somatic hybridization, in vitro selection and somaclonal variation	
15. Basic bibliografy	1. Sathyanarayana B. N. 2007. Plant Tissue Culture: Practices and New Experimental Protocols I. K. International Pvt Ltd 2. Plant Propagation by Tissue Culture. 2008. Edited by Edwin F. George, Michael A. Hall, Geert-Jan De Klerk. Springer 3. Plant Cell Culture. Essential Methods. 2010. Ed. Davey M.R., Anthony P. Willey-Blackwell,. 4. Experiments in Plant tissue culture. 1985. Secon Edition. Ed. Dodds, J.H., Roberts L.E. Cambridge University Press 5. Plant Embryo Culture. Methods and Protocols. 2011. Thorpe T.A., Yeung E.C. Humana Press	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	The student explains the nature of plant growth processes, which are relevant to tissue culture. Differentiate between different types of plant tissue cultures. Understand the management of environmental control in tissue culture.

	16.2 Application	The student is able to use the tissue culture lab equipment. Prepares growing media. Applies appropriate tissue culture methods and procedures for different purposes and determinates commercial applications for tissue culture. Interprets and reports obtained results.
	16.3 Reflection	The student expresses unbiased opinions on the role of the tissue cultures in crop improvement.
	16.4 Transferable skills – not tied to just one subject	Teamwork
17. Methods of teaching and learning	Lectures, laboratory practicals and seminars.	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course. Pre-requisite is a basic course in biology.	
19. Methods of assessment and the assessment scale	- Written exam (70%) - Attendance at laboratory practicals (30%) Evaluation scale: Grades from 2.0 (worst) to 5.0 (best)	
20. Method of evaluation of course quality	Student questionnaire.	
21. Curriculum compiler	Dr. Agnieszka Kiełkowska, University of Agriculture in Krakow Dr. Alicja Chuda, University of Agriculture in Krakow	

1. Title of subject/module/unit				**Social Insect Ecology**					
2. Unit code				**3. Number of ECTS credits**			**5**		
4. Contact hours		**Total 40**		**L 20**		**E 20**	**S**		**Other forms**
5. Cycle	**Master´s**	**6. Year**	**1st**		**7. Semester**		**1st**		
8. Study programme		**International Master of Science in Horticulture**			**9. Branch of study**				
10. Pillar of the programme		**Facultative**			**11. Language**		**English**		
12. Special features									

13. Objectives and subject-specific competences	Knowledge on ecology and life history of bees, ants and wasps, their behaviour, nest structure, communication and importance in agriculture.	
14. Description of content	Evolution of social behaviour, comparison between social and solitary insects, division of labour in social insects, communication between colony members, importance of social insects for pollination of corps and pest control, biology of honey bees, bumble bees, ants and wasps.	
15. Basic bibliografy	Wilson, E. (1971) The insect societies. Belknap, Cambridge, MA. Hölldobler, B., Wilson, E. O. (2009). The superorganism: the beauty, elegance, and strangeness of insect societies. WW Norton & Company.	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	The student defines social and solitary insects, describes biology of bees, ants and wasps, understands evolution of social insects, presents examples of social insects communication, describes beneficial role of social insects in agriculture**.**
	16.2 Application	The student knows how to behave in order to avoid stinging by bees, analyse data in order to understand behaviour of bees, is able to plan pollination of crops.
	16.3 Reflection	The student is capable of formulating unbiased opinions on the use of different species for pollination of crops.
	16.4 Transferable skills – not tied to just one subject	Teamwork, ability to present and defend personal opinions.
17. Methods of teaching and learning	Lectures, laboratory practicals.	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course. Basic computer skills.	
19. Methods of assessment and the assessment scale	- Written exam (100%) - Attendance at laboratory practicals and preparation of laboratory Evaluation scale: Grades from 2.0 (worst) to 5.0 (best)	
20. Method of evaluation of course quality	Student questionnaire.	
21. Curriculum compiler	Dr. Adam Tofilski, University of Agriculture in Krakow	

1. Title of subject/module/unit				**Soiless Cultivation Systems**					
2. Unit code				**3. Number of ECTS credits**			**5**		
4. Contact hours			**Total 25**	**L 15**		**E 10**	**S 0**		**Other forms**
5. Cycle	**Master´s**	**6. Year**	**1st**		**7. Semester**		**1st**		
8. Study programme		**International Master of Science in Horticulture**			**9. Branch of study**				
10. Pillar of the programme		**Optional**			**11. Language**		**English**		
12. Special features									

13. Objectives and subject-specific competences	To acquaint the student with the latest techniques of plant cultivation under cover. Student gets the knowledge about physical and chemical properties of growing medium for proper selection of a plant cultivation techniques. Student aquires the ability to prepare nutrient solution and adjust its composition to a stage of growth of plant.	
14. Description of content	Overview of soilless cultivation methods. Types and selection of growing medium. The chemical properties of water intended for fertigation. Collecting of samples of water and nutrient solution for chemical analysis. Methods for chemical analysis of water and nutrient solutions. Water treatment methods. Cleaning of the irrigation system. Fertilizers used on crops with fertigation. Preparation of nutrient solution. Preparation of glasshouse for cultivation in rockwool. Methods of nutrient solutions disinfecting.	
15. Basic bibliography	Barker A.V., Pilbeam D.J. (eds.) 2007. Handbook of plant nutrition. Taylor&Francis Marschner H. 1995. Mineral nutrition of higher plants. Academic Press Inc. Chmel H. 1994. Uprawa roślin ozdobnych. PWRiL. Chochura P. 2007. Podłoża ogrodnicze. Plantpress w-w. Pudelski T. (praca zb.) 1993. Uprawa warzyw pod osłonami. PWRiL W-wa. Pribyl J. 1990. Hydroponika dla każdego. PWRiL W-wa. Wysocka-Owczarek M. 2001. Pomidory pod osłonami. Hortpress W-wa. Wysocka-Owczarek M. 2007. Ocena wzrostu i aktywności roślin oraz ważniejszych parametrów klimatyczno-uprawowych. Hortpress Sp.z o.o. Uprawa ogórków pod osłonami (praca zb.). 1999. Wyd. Instytut Warzywnictwa w Skierniewicach.	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	Student describes various techniques of soilless cultivation, indicates their usefulness. Differentiates between growing medium and assigns them specific properties. Demonstrates general knowledge about irrigation systems. Demonstrates knowledge of cultivation, fertilization and fertigation of selected plant species.

	16.2 Application	Student is able to collect nutrient solutions' sample for analysis and is able to determine their chemical composition. Student can choose optimal nutrient solution for selected plant species. Student knows the rules for determining the composition of the nutrient solution and the rules of selection of fertilizers.
	16.3 Reflection	Students understands the need to formulate the views on achievements in advanced technologies in horticulture and their influence on the environment.
	16.4 Transferable skills – not tied to just one subject	Teamwork, ability to present and defend personal opinions, responsibility for team realized projects.
17. Methods of teaching and learning	Lectures, laboratory practicals.	
18. Conditions for inclusion or to undertake work required	Pre-requisite is a basic course in nutrition of horticultural plants.	
19. Methods of assessment and the assessment scale	- Written exam (60%) - Attendance at laboratory practicals and preparation of laboratory reports (40%) Evaluation scale: Grades from 2.0 (worst) to 5.0 (best)	
20. Method of evaluation of course quality	Student questionnaire.	
21. Curriculum compiler	Dr. Iwona Kowalska, University of Agriculture in Krakow MSc. Anna Konieczny, University of Agriculture in Krakow	

1. Title of subject/module/unit				**Grape and Wine Evaluation**					
2. Unit code	**541Z501**			**3. Number of ECTS credits**			**4**		
4. Contact hours		**Total 36**		**L 0**		**E 36**	**S**		**Other forms**
5. Cycle	**Master´s**	**6. Year**	**2nd**		**7. Semester**		**4th**		
8. Study programme		**International Master of Science in Horticulture**			**9. Branch of study**				
10. Pillar of the programme		**Optional**			**11. Language**		**Slovak / English**		
12. Special features									

13. Objectives and subject-specific competences	Providing student with knowledge about exploitation of classification parameters of grape uvological analysis, theoretical and practical expertness in laboratory analyses of must and wine. Mastering of sensorial analysis of wine.
14. Description of content	Content, nutritional substances in grapes, production and accumulation of content substances in the ripening process of grapes. The requirements for table grapes, uvological analysis, sensorial evaluation of table grapes. Assessment of grapevine, basic chemical analysis of must. Influence of fermentation, racking need, application of SO2 (sulphuring), clarification and stabilization of wine on its quality. Basic chemical analysis of wines, natural and extraneous components of wine. Standards related to the quality of grapes and wine. Sensorial evaluation of wine.
15. Basic bibliografy	**Chemical Analysis of Grapes and Wine: Techniques and Concepts.** 2004. P. Iland, N. Bruer, G. Edwards, S. Weeks, and E. Wilkes. Patrick Iland Wine Promotions, Campbelltown, South Australia. **Chemistry of Wine Flavor.** 1998. A.L. Waterhouse and S. E. Ebeler (eds.). American Chemical Society, Washington, D.C. **Concepts in Wine Chemistry, 2nd Edition.** 2004. Y. Margalit. Wine Appreciation Guild. San Francisco, California. **Cooperage for Winemakers: A manual on the construction, maintenance, and use of oak barrels.** 1992. G. Schahinger and B. Rankine. Ryan Publications, Adelaide, South Australia. **Handbook of Enology Volume 1: Microbiology of Wine and Vinifications.** Second Edition. 2006. P. Ribereau-Gayon, D. Dubourdieu, B. Doneche, and A. Lonvaud (eds.), John Wiley & Sons, New York. **Managing Wine Quality: Volume 2, Oenology and Wine Quality.** 2010. A.G. Reynolds (ed.). Woodhead Publishing, Cambridge, UK. **Wine Microbiology: Practical Applications and Procedures.** Second Edition. 2007. K.C. Fugelsang and C.G. Edwards. Springer Science and Business Media, New York. **Wine Tasting: A Professional Handbook,** 2nd Edition**.** 2009. R.S. Jackson. Academic Press. **Winery Planning & Design.** 16th Edition**.** 2011. B. Zoecklein. CD format. Practical Winery & Vineyard, San Rafael, CA **Methods For Analysis of Musts and Wines.** Second Edition. 1988. C.S. Ough and M.A. Amerine. J. Wiley & Sons, New York.

16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	Students will get knowledge on content, nutritional substances in grapes, production and accumulation of content substances in the ripening process of grapes.
	16.2 Application	Lab activities will focus on basic chemical analysis of wines, natural and extraneous components of wine. Standards related to the quality of grapes and wine. Sensorial evaluation of wine. Methods of evaluation will be oriented toward the future practical activities of graduate students.
	16.3 Reflection	Graduate of the subject manages basic chemical analysis of wines, natural and extraneous components of wine, and is able to design their use within the system of wine and grape evaluation. Manages Standards related to the quality of grapes and wine.
	16.4 Transferable skills – not tied to just one subject	This knowledge has applications hroughout the food industry, and could extend into management of wine and grape.
17. Methods of teaching and learning	Excercises.	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course.	
19. Methods of assessment and the assessment scale	- Written exam (100%) Evaluation scale: Grades from A (best) to FX (worst)	
20. Method of evaluation of course quality	Student questionnaire.	
21. Curriculum compiler	Ing. Eduard Pintér, PhD., Slovak University of Agriculture in Nitra	

1. Title of subject/module/unit			**Integrated systems of fruit production**				
2. Unit code	**622Z410**		**3. Number of ECTS credits**		**6**		
4. Contact hours		**Total 48**	**L 24**	**E 24**	**S**	**Other forms 5**	
5. Cycle	**Master´s**	**6. Year**	**2nd**	**7. Semester**	**4th**		
8. Study programme	**International Master of Science in Horticulture**		**9. Branch of study**				
10. Pillar of the programme	Compulsory		**11. Language**	Slovak / English			
12. Special features							

13. Objectives and subject-specific competences	Profilation of a student to a specialist in integrated fruit growing systems directly applicable in practice. Learning outcomes – The graduate of the subject is able to impelement technological practises of integrated fruit production asserting the established legislative of integrated fruit production.	
14. Description of content	The subject advises students of integrated fruit production systems implementation into the orchards of Slovak republic. Includes the issues of optimal fruit tree growing by thrifty inlets on environment with the emphasis on integrated pest managamant against the most important pest and diseases with the use of automatical meteorological stations and software programmes. Cluster 1: Definition of terms. Aims and denotations of inegrated production. Legislatives in IFP. Cluster 2: Signalizations and prognoses. Function of IT in IFP. Role of pesticides in IFP. Cluster 3: Biological control, natural enemies of pests and diseases. Cluster 4: Integrated production of pome fruits. Cluster 5: Integrated production of stone fruits. Cluster 6: Integrated production of beery fruits and nut fruits.	
15. Basic bibliografy	Ohlendorf, B. 1999. Integrated Pest Management for Apples and Pears, 2nd Edition, University of California, Agricultural and natural resources, ISBN-13: 978-1-879906-42-6, 231pp. Strand, L. 1999. Integrated Pest Management for Stone Fruits, University of California, Agricultural and natural resources, ISBN-13: 978-1-879906-36-5, 264pp. Strand, L. 2008. Integrated Pest Management for Strawberries, 2nd Edition, University of California, Agricultural and natural resources, ISBN-13: 978-1-60107-489-8, 176pp. Strand, L. 2003. Integrated Pest Management for Walnuts-Third Edition, University of California, Agricultural and natural resources, ISBN-13: 978-1-879906-62-4, 136pp.	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	Students will get knowledge on integrated fruit production systems implementation into the orchards of Slovak republic, and optimal fruit tree growing by thrifty inlets on environment with the emphasis on integrated pest managamant against the most important pest and diseases with the use of automatical meteorological stations

	16.2 Application	Activities will focus on definition of terms. Aims and denotations of inegrated production. Legislatives in IFP, signalizations and prognoses. Function of IT in IFP. Role of pesticides in IFP, biological control, natural enemies of pests and diseases, integrated production of beery fruits and nut fruits, integrated production of pome fruits, integrated production of stone fruits. Methods of integrated systems of fruit production will be oriented toward the future practical activities of graduate students.
	16.3 Reflection	The graduate of the subject is able to impelement technological practises of integrated fruit production asserting the established legislative of integrated fruit production.
	16.4 Transferable skills – not tied to just one subject	This knowledge has applications throughout the integrated system of fruits production, and could extend into food industry.
17. Methods of teaching and learning	Lectures, exercises, field practices	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course.	
19. Methods of assessment and the assessment scale	- Written exam (100%) Evaluation scale: Grades from A (best) to FX (worst)	
20. Method of evaluation of course quality	Student questionnaire.	
21. Curriculum compiler	doc. Ing. Oleg Paulen, PhD., Slovak University of Agriculture in Nitra	

1. Title of subject/module/unit			**Post-harvest technology of horticultural crops**				
2. Unit code	**622Z410**		**3. Number of ECTS credits**		**6**		
4. Contact hours		**Total 36**	**L 12**	**E 24**	**S**		**Other forms**
5. Cycle	**Master´s**	**6. Year**	**2nd**	**7. Semester**	**3rd**		
8. Study programme	**International Master of Science in Horticulture**		**9. Branch of study**		**Horticulture**		
10. Pillar of the programme	Compulsory		**11. Language**	Slovak / English			
12. Special features							

13. Objectives and subject-specific competences	Get information on the post-harvest technology of horticultural crops adjustments, storage, packaging and transporting.
14. Description of content	Basic concepts, the quality of horticultural crops, effects on quality, quality requirements, management of quality, losses and reserves in production systems, post-harvest physiology of horticultural crops, physiological disorders of horticultural crops, internal and external conditions shelf crops, post harvest operations, types of stores, the process of storage, market adjustments.
15. Basic bibliografy	VERMA, L.R. - JOSHI, V.K. *Postharvest Technology of Fruits and Vegetables.* New Delhi : Indus Pub. Co., 2000, 1229 p. ISBN 81-7387-108-6 KADER, A.A. *Postharvest technology of horticultural crops.* Third edition. University of California, Agriculture and Natural Resources, Publication 3311, 2002, 535p. ISBN 1-879906-51-1 KITINOJA, L. – KADER, A.A.. Small-scale postharvest handling practices: A manual for horticultural crops (4th edition). Univ. Calif. Postharvest Horticulture Series No. 8E, 2002, 260pp. MAYNARD, D.N. – HOCHMUTH G.J. – KNOTT, J.E. Knott's Handbook for Vegetable Growers. New Jersey : John Wiley and Sons, Inc. 2007, fifth edition, 621 p. ISBN 978-0471-73828-2 SUDHEER, K.P. – INDIRA, V. *Post Harvest Technology of Horticultural Crops*. New India Publishing Agency, 2007. 290 p. ISBN 81-89422-43-X REES, D. - FARRELL, G. – ORCHARD, J. *Crop Post-Harvest: Science and Technology, Perishables*. Blackwell Publishing Ltd, west Sussex, UK, 2012, 464 p. Online ISBN 9781444354652 BOKOR P., ČERNÝ I., EFTIMOVÁ J., HABÁN M., KAZDA J., KOHAUT P., KOVÁČIK P., MEZEY J., VALŠÍKOVÁ M.: 2010. Ochrana a pestovanie rastlín. Obrazovo a textovo spracované multimediálne. (Protection and plant cultivation. Textual and pictorial processed multimedia) DVD. Agroinštitút v Nitre, ISBN:978 - 80-7139-140-1. JAKÁBOVÁ, A., KOBZA, F.: 2008. Kvetinárstvo. Učebné skriptá, (Floriculture. Teaching textbook), SPU, FZKI, Katedra biotechniky parkových a krajinných úprav, Vydavateľstvo SPU v Nitre, 161 s. UHER, A., JAKÁBOVÁ, A., MEZEY, J. 2007. Záhradníctvo. (Horticulture), Vydavateľstvo SPU v Nitre, 162 s., ISBN 978-80-8069-

	963-5. UHER A., KÓŇA J., VALŠÍKOVÁ M., ANDREJIOVÁ A.: 2009. Zeleninárstvo – poľné pestovanie. Vysokoškolská učebnica, Vydavateľstvo SPU v Nitre, 212 s., ISBN 978-80-552-0199-3. VALŠÍKOVÁ, M., KOPEC, K.: 2009. Pozberová technológia záhradníckych plodín. Vydavateľstvo SPU v Nitre, 158 s., ISBN 978-80-552-0313-3.	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	Students will get knowledge on post-harvest technology of horticultural crops adjustments, storage, packaging and transporting.
	16.2 Application	Activities will focus on quality of horticultural crops, effects on quality, quality requirements, management of quality, losses and reserves in production systems, post harvest operations and machine lines, types of stores, the process of storage, market adjustments. Methods of post-harvest technologies will be oriented toward the future practical activities of graduate students.
	16.3 Reflection	Graduate of the subject manages post harvest operations, the process of storage, and market adjustments
	16.4 Transferable skills – not tied to just one subject	This knowledge has applications throughout the horticultural crops production, and food industry.
17. Methods of teaching and learning	Lectures, exercises	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course.	
19. Methods of assessment and the assessment scale	- Written exam (100%) Evaluation scale: Grades from A (best) to FX (worst)	
20. Method of evaluation of course quality	Student questionnaire.	
21. Curriculum compiler	Prof. Ing. Magdaléna Valšíková, PhD., Slovak University of Agriculture in Nitra	

1. Title of subject/module/unit				**Vegetable seed production**					
2. Unit code	**622Z209**			**3. Number of ECTS credits**		**3**			
4. Contact hours		**Total 24**		**L 0**	**E 24**		**S**		**Other forms**
5. Cycle	**Master´s**	**6. Year**	**2nd**		**7. Semester**	**3rd**			
8. Study programme	**International Master of Science in Horticulture**			**9. Branch of study**		**Horticulture**			
10. Pillar of the programme	Optional			**11. Language**	Slovak / English				
12. Special features									

13. Objectives and subject-specific competences	The aim of subject is to teach students the basic methods of production of vegetable and flower seeds.	
14. Description of content	The use of genetic resources in seed production, legislation, the quality and characteristics of the seeds, effects on seed quality, the general conditions of vegetables and flower seed production, post-harvest treatment of seeds, storage and treatment of seeds before sowing, production of vegetables seeds, production of flowers seeds.	
15. Basic bibliografy	GEORGE RAYMOND A. T. *Vegetable Seed Production*. UK by MPG Books Group, Bodmin, 2009. 320 p. ISBN 978-1-84593-521-4 MAYNARD, D.N. – HOCHMUTH G.J. – KNOTT, J.E. *Knott's Handbook for Vegetable Growers*. New Jersey : John Wiley and Sons, Inc. 2007, fifth edition, 621 p. ISBN 978-0471-73828-2 LOEWER, H. P. *Seeds: The Definitive Guide to Growing, History, and Lore*. UK : Timber Press, 2005, 229 p. ISBN 0-88192-682-5 SRIVASTAVA, J. P. SIMARSKI, L. T. *Seed Production Technology*. Aleppo : International Center for Agricultural Research in the Dry Areas, 1986, 287 p. HEBBLETHWAITE, P. D. *Seed production*. UK : Butterworths, 1980, 694 p. JAKÁBOVÁ, A., KOBZA, F.: 2008. Kvetinárstvo. Učebné skriptá, (Floriculture. Teaching textbook), SPU, FZKI, Katedra biotechniky parkových a krajinných úprav, Vydavateľstvo SPU v Nitre, 161 s. KÓŇA, J. Množiteľské technológie v záhradníctve. (The multiplication technology in horticulture). Vydavateľstvo SPU v Nitre, 132 s., ISBN 978-80-8069-884-3. UHER A., KÓŇA J., VALŠÍKOVÁ M., ANDREJIOVÁ A.: 2009. Zeleninárstvo – poľné pestovanie. Vysokoškolská učebnica (Vegetable growing - field cultivation. University textbook) Vydavateľstvo SPU v Nitre, 212 s., ISBN 978-80-552-0199-3. VALŠÍKOVÁ, M., KOPEC, K.: 2010. Semenárstvo zeleniny a kvetín. (Seed production of vegetables and flowers). Vydavateľstvo SPU v Nitre, 131 s., ISBN 978- 80-552-0487-1.	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	Students will get knowledge on methods of production of vegetable and flower seeds.

	16.2 Application	Activities will focus on use of genetic resources, legislation, the quality and characteristics of the seeds, storage and treatment of seeds before sowing. Methods of seed production and treatment of seeds before sowing will be oriented toward the future practical activities of graduate students.
	16.3 Reflection	Graduate of the subject manages basic and miscellaneous methods seed production and treatment. Manages activities related to horticultural crops seed production.
	16.4 Transferable skills – not tied to just one subject	This knowledge has applications throughout the horticulture, seed conservation and could extend into plant production.
17. Methods of teaching and learning	Excercises.	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course.	
19. Methods of assessment and the assessment scale	- Written exam (30%) - Presentation of seminar paper (70%) Evaluation scale: Grades from A (best) to FX (worst)	
20. Method of evaluation of course quality	Student questionnaire.	
21. Curriculum compiler	prof. Ing. Magdaléna Valšíková, PhD., Slovak University of Agriculture in Nitra	

1. Title of subject/module/unit			**Special Fruit Growing**				
2. Unit code	**622Z314**		**3. Number of ECTS credits**		**6**		
4. Contact hours		**Total 52**	**L 24**	**E 24**	**S**	**Other forms 5**	
5. Cycle	**Master´s**	**6. Year**	**1st**	**7. Semester**	**1st**		
8. Study programme	**International Master of Science in Horticulture**		**9. Branch of study**				
10. Pillar of the programme	Compulsory		**11. Language**	Slovak / English			
12. Special features							

13. Objectives and subject-specific competences	Gaining student´s ability to realize methodology of fruit orchard establishing – practical realization and advisory service, commanding technology of the most up-to-date growing systems of all the basic fruit species. Learning outcomes – the graduate is able to project and to realize a highly intensive fruit orchard with the use of the most modern technological equipments for selected fruit species and variety.	
14. Description of content	Growing technology of selected fruit species – site selection, investments for various operations, soil preparation. Suitable rootstocks and cultivars for commercial orchards. Dates and planting techniques. gricultural operations during vegetation. Training and pruning systems. Weed elimination. Fertilizing and irrigation. Pest and disease management. Fruit picking. Modern trends in biological material outplanting. Cluster 1: Extensive and intensive fruit plantings. Intesification of fruit production. Cluster 2: Particularity of growth, yielding and trainig and pruning of fruit trees. Cluster 3: The most important pests and diseases of fruit trees. Cluster 4: Intensive growing technology of pome fruits. Cluster 5: Intensive growing technology of stone fruits. Cluster 6: Intensive growing technology of berry and stone fruits.	
15. Basic bibliografy	Pike, B. 2011. The fruit tree handbook. Green Books Dartington Space, Dartington Hall, Totnes, Devon, TQ96EN, ISBN 978-1-900322-74-4, 350pp. Lespinasse, J.-M., Leterme, É. 2011. Growing Fruit Trees - Novel Concepts and Practices for Successful Care and Management, W. W. Norton & Company, ISBN 978-0-393-73256-6, 352 pp. – Blažek, J. a kol.: Ovocnictví. Praha: Květ, 1998. ISBN 80-85362-33-3 Hričovský I. a kol.: Drobné ovocie. Príroda, Bratislava 2000. Hričovský, I a kol.: Pomológia I., Nezávislosť, Bratislava 2001 Hričovský, I a kol.: Pomológia II., Nezávislosť, Bratislava 2003 Hričovský, I. a kol.: Praktické ovocinárstvo. Bratislava: Príroda, 1990. 636 s. ISBN 80-07 00024-0	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	Students will learn the principles of of fruit orchard establishing – practical realization and advisory service, commanding technology of the most up-to-date growing systems of all the basic fruit species.

	16.2 Application	Activities will focus on lethal and inhibitory agents in relation to extensive and intensive fruit plantings. Intesification of fruit production, particularity of growth, yielding and trainig and pruning of fruit trees, the most important pests and diseases of fruit trees, intensive growing technology of pome fruits, intensive growing technology of stone fruits, intensive growing technology of berry and stone fruits. Methods of special fruit growing will be oriented toward the future practical activities of graduate students.
	16.3 Reflection	Graduate is able to project and to realize a highly intensive fruit orchard with the use of the most modern technological equipments for selected fruit species and variety.
	16.4 Transferable skills – not tied to just one subject	This knowledge of preventing possible microbial spoilage has applications throughout the fruit growing technoligies, production of modern biological material.
17. Methods of teaching and learning	Lectures, seminars, excursion, field practices.	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course.	
19. Methods of assessment and the assessment scale	- Written exam (100%) Evaluation scale: Grades from A (best) to FX (worst)	
20. Method of evaluation of course quality	Student questionnaire.	
21. Curriculum compiler	doc. Ing. Oleg Paulen, PhD., Slovak University of Agriculture in Nitra	

1. Title of subject/module/unit			**Pruning and Training of Fruit Trees**				
2. Unit code	**622Z209**		**3. Number of ECTS credits**		**4**		
4. Contact hours		**Total 36**	**L 0**	**E 13**	**S**	**Other forms 23**	
5. Cycle	**Master´s**	**6. Year**	**2nd**	**7. Semester**	**3rd**		
8. Study programme	**International Master of Science in Horticulture**		**9. Branch of study**				
10. Pillar of the programme	Compulsory		**11. Language**	Slovak / English			
12. Special features							

13. Objectives and subject-specific competences	Providing students with knowledge on physiological conditioning of growth and yielding and its exploitation in fruit woods pruning and training, and with practical experience related to fruit woods pruning. Learning outcomes – graduate of the subject manages basic and miscellaneous methods of pruning, and is able to design their use within the system of fruit woods care in dependence of plantation state and expected results. Manages activities related to training and pruning of fruit woods independently.	
14. Description of content	Terminology related to the field. Classification of tree forms. Goals of fruit woods pruning. Basic principles regulating growth and yielding of fruit woods. Physiologically based pruning. Basic and miscellaneous pruning methods, classification of pruning according to tree age (forming, regulating and rejuvenation pruning), material and tools used for fruit woods pruning and training. Contribution of pruning and forming to fruit production intensity. Pruning and training of individual fruit species – apple tree, pear, quince, medlar, sweet and sour cherries, apricot, peach tree, plum tree, currants, gooseberry, raspberries, blackberries, miscellaneous and shell fruit species – typical tree (bush) forms and their characteristics, practical procedure of training of the selected tree (bush) forms and regulating pruning.	
15. Basic bibliografy	Brunner, T.: Physiological Fruit Tree Training for Intensive Growing. Budapest: Akadémiai Kiadó, 1990. 286 pp. ISBN 963-05-5345-7 Somerville, W.: Pruning and Training Fruit Trees. Australia : eed International Books Australia, 1996. 144 p. ISBN 0750689315 – Blažek, J. a kol.: Ovocnictví. Praha: Květ, 1998. ISBN 80-85362-33-3 Brunner, T.: Physiological Fruit Tree Training for Intensive Growing. Budapest: Akadémiai Kiadó, 1990. 286 pp. ISBN 963-05-5345-7 Matuškovič, J.-Paulen, O.: Základy ovocinárstva. Nitra: SPU, 2001. 137 s. ISBN 80-7137-850-X	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	Students will get knowledge on physiological conditioning of growth and yielding and its exploitation in fruit woods pruning and training, and with practical experience related to fruit woods pruning.

	16.2 Application	Activities will focus on terminology related to the field, classification of tree forms, goals of fruit woods pruning, basic principles regulating growth and yielding of fruit woods, physiologically based pruning.Methods of pruning will be oriented toward the future practical activities of graduate students.
	16.3 Reflection	Graduate of the subject manages basic and miscellaneous methods of pruning, and is able to design their use within the system of fruit woods care in dependence of plantation state and expected results. Manages activities related to training and pruning of fruit woods independently.
	16.4 Transferable skills – not tied to just one subject	This knowledge has applications throughout the food industry, and fruit production.
17. Methods of teaching and learning	Lectures, excursion, field practices.	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course.	
19. Methods of assessment and the assessment scale	- Written exam (100%) Evaluation scale: Grades from A (best) to FX (worst)	
20. Method of evaluation of course quality	Student questionnaire.	
21. Curriculum compiler	Ing. Ján Mezey, PhD., Slovak University of Agriculture in Nitra	

1. Title of subject/module/unit			**Horticultural dendrology**				
2. Unit code	**622Z217**		**3. Number of ECTS credits**		**5**		
4. Contact hours		**Total 48**	**L 24**	**E 24**	**S**		**Other forms**
5. Cycle	**Master´s**	**6. Year**	**2nd**	**7. Semester**	**4rd**		
8. Study programme	**International Master of Science in Horticulture**		**9. Branch of study**				
10. Pillar of the programme	**Optional**		**11. Language**	English			
12. Special features							

13. Objectives and subject-specific competences	The Horticulture students will learn basic assortment of deciduous, coniferous and evergreen species of decorative plants. They will learn morphological marks, ecological needs and landscape use of the most used decorative, native and introduced woody plant species, forms and cultivars. Students will learn also multiplication, growing methods and use of wide assortment of decorative plants. After completion of the subject the student is able to identify basic assortment of woody plants and their cultivars, understands eco-cultivation needs, and is able to apply knowledge of dendrology in the landscape creation.	
14. Description of content	Terminology related to the field. Morphological, systematic and ecological characteristics of deciduous, evegreen and coniferous domestic and exotic woods. Basic morphological features of trees and their importance for mutual differentiation and systematic distribution. Characteristics and properties of trees, spatial and functional division of of trees the conditions of application and development of healthy plants in horticultural creation.	
15. Basic bibliografy	DEBRECZY, Z. -- RÁCZ, I. *Conifers around the world (I., II.)*. edited by Kathy Musial Budapest : DendroPress Ltd., 2011. Two volumes - 1,089 pages, 474 range maps, 1,300 line drawings, 3,700 color photographs. ISBN 978-963-219-061-7 DIRR, M.A. *Dirr's Hardy Trees and Shrubs.* Timber Press, Portland, 1998. 493 p. ISBN 0-88192-404-0 CULLEN, J. *Hardy Rhododendron Species.* Timber Press, Portland, 2005. 496 p. ISBN 0-88192-723-6 Hillier Nurseries, Winchester. *The Hillier manual of trees & shrubs*. Newton Abbot: David & Charles, 1991. FITSCHEN, J. *Gehölzflora*. Ed. Franz H. Meyer. Quelle und Meyer, 2002. HARDIN, JAMES W., DONALD J. LEOPOLD, AND FRED M. WHITE. "*Textbook of dendrology*." New York: McGraw-HilI (2001). HARDIN, JAMES WALKER, DONALD JOSEPH LEOPOLD, AND FRED M. White. *Harlow & Harrar's textbook of dendrology*. New York: McGraw-Hill, 2001.	
16. Envisaged learning outcomes	*16.1 Knowledge and understanding*	Students will get knowledge on different characteristics of woody plants and their needs and ways of using.
	16.2 Application	Activities will focus on terminology related to the field, classification of tree forms, goals of woods using within horticulture creation. Dendrology knowledge will be oriented toward the future practical activities of graduate students.

	16.3 Reflection	Graduate of the subject is able to identify basic assortment of woody plants and their cultivars, understands eco-cultivation needs, and is able to apply knowledge of dendrology in the landscape creation.
	16.4 Transferable skills – not tied to just one subject	This knowledge has applications throughout the multiplication and conservation of woody plants, and horticultural creation.
17. Methods of teaching and learning	Lectures, excercises.	
18. Conditions for inclusion or to undertake work required	Enrolment in the year of the course.	
19. Methods of assessment and the assessment scale	- Written exam (100%) Evaluation scale: Grades from A (best) to FX (worst)	
20. Method of evaluation of course quality	Student questionnaire.	
21. Curriculum compiler	Ing. Katarína Rovná, PhD., Slovak University of Agriculture in Nitra	