First Draft for an ECVET Module: FOOD ANALYSIS

Title of the field of action	**Food Analysis**	
EQF Level		
Total ECVET points		
Units of Learning outcomes	**U1**	**Sampling and preparation of food samples**
	U2	**Extraction of different food contents, extraction methods**
	U3	**Chromatographic separation of food contents**
	U4	**Identification of compounds**
	U5	**Quantification of compounds**
	U6	**Calculation, evaluation and presentation of data**
Cross sectional Learning Outcomes	To acquire the learning outcomes following quailfications are essential He/she is able to apply and adopt different analysis methods use and control different analysis apparatus apply different kinds of software for data acquisition and evaluation	

LO1_Sampling and preparation of food samples	**LO2_Extraction of different food contents**	**LO3_Liquid-chromatographic separation of food contents**
Sampling Lyophilization Homogenization	Extraction by sonification Liquid-Liquid Extraction SPE Removal of solvent	RP-HPLC Stationary phases, normal phase, HILIC Gradient/Isocratic elution
LO4_Identification of food contents (Detection)	**LO5_Quantification of food contents**	**LO6_Data handling**
UV-Vis spectra Mass Spectrometric identification Basics of IR and NMR	Calibration Curves External/Internal Standard Calculation of recovery rates Quantification of compounds	Software handling Evaluation and interpretation of data Presentation of results

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Unit of Learning Outcome 1: Sampling and preparation of food samples			
Competence		Skills	Knowledge
Competence Level A	He/she is able to: • Prepare food samples according to instructions	He/she is able to: • Sample diverse foods • Apply lyophilisation and homogenization methods	He/she knows about: • Significance of sample size • Sample preparation of different foods – advantages and disadvantages • Suitability of different sample methodologies for diverse food contents
Competence Level B	He/she is able to: • Choose the appropriate methods depending on the respective sample characteristics • Recognize and work out typical problems regarding sampling and sample preparation	He/she is able to: • Calculate necessary sample size • Apply the appropriate preparation procedure	

Work task	**Competence Level**
Sampling of tomatoes	A
Lyophilization of tomatoes	A
Homogenization of freeze dried tomatoes	A
Sampling of a (unknown) project sample	B
Lyophilization a (unknown) project sample	B
Homogenization a (unknown) project sample	B

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Unit of Learning Outcome 2: Extraction of different food contents			
Competence		Skills	Knowledge
Competence Level A	He/she is able to: • Extract food samples according to instructions	He/she is able to: • Extract target analytes from food samples • Apply extraction methods	He/she knows about: • Differences between extraction methods • Advantages/Disadvantages of extraction methods • Suitability of extraction methods for diverse target analytes
Competence Level B	He/she is able to: • Choose the appropriate extraction methods depending on the respective sample characteristics and target analytes • Recognize and work out typical problems regarding extraction methods	He/she is able to: • Extract diverse analytes from different food samples • Apply the appropriate extraction procedure	

Work task	**Competence Level**
Extraction of phenolics compounds from lyophilized tomatoes by sonification	A
Removal of solvent	A
Choose a method for extraction of another group of food contents	B
Extraction of another group of food contents, e.g. carotenoids	B
Removal of solvent	B

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Unit of Learning Outcome 3: Liquid-chromatographic separation of food contents			
Competence		Skills	Knowledge
Competence Level A	He/she is able to: • Separate phenolic compounds by RP-HPLC	He/she is able to: • Apply RP-HPLC methods to separate food contents	He/she knows about: • Assembly and function of chromatographic devices • Chromatographic parameters • Different stationary phases and their fields of use • Characteristics of different eluting solvents • Gradient and isocratic elution • Retention/separation behaviour of different food contents
Competence Level B	He/she is able to: • Choose the appropriate separation method depending on the target analytes • Recognize and work out typical problems regarding chromatographic methods	He/she is able to: • Separate diverse food contents by different separation methods • Choose the appropriate separation methods depending on the target analytes	

Work task	**Competence Level**
Prepare extracted samples for HPLC analysis (dissolve, filtrate)	A
Separate phenolics compounds by RP-HPLC	A
Choose and develop a suitable method for separation of other food contents	B
Separate other food contents by the developed method	B

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Unit of Learning Outcome 4: Identification of food contents (Detection)			
Competence		Skills	Knowledge
Competence Level A	He/she is able to: • Detect and identify phenolic compounds by UV-Vis and mass spectrometry	He/she is able to: • Interprete UV-Vis and mass spectra	He/she knows about: • Characteristics of common HPLC detectors and their fields of use • Characteristics of food contents regarding detection • Use of UV-Vis and mass spectra to identify compounds • Basics of IR and NMR
Competence Level B	He/she is able to: • Choose the appropriate detector depending on the target analytes • Recognize and work out typical problems regarding detection issues	He/she is able to: • Apply different detection methods	

Work task	**Competence Level**
Identify phenolics compounds by UV-Vis and mass spectra	A
Choose the appropriate detector for other food contents	B
Identify other food contents	B

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Unit of Learning Outcome 5: Quantification of food contents			
Competence		Skills	Knowledge
Competence Level A	He/she is able to: • Calculate calibration curves • Quantify food contents by use of external standards	He/she is able to: • Prepare calibration curves • Work with external standards	He/she knows about: • Relevance of concentration ranges for calibration curves • Regression lines • Prerequisites for internal standards
Competence Level B	He/she is able to: • Choose suitable internal standards • Calculate recovery rates • Quantify food contents by combination of external and internal standards	He/she is able to: • Work with external and internal standards •	

Work task	**Competence Level**
Quantification of phenolics compounds	A
Choose of a suitable internal standard	B
Calculate recovery rates	B
Quantification of food contents using external and internal standards	B

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Unit of Learning Outcome 6: Data handling			
Competence		Skills	Knowledge
Competence Level A	He/she is able to: • Evaluate data quality • Handle data according to Good Scientific Practice • Understand graphs	He/she is able to: • Work with different acquisition software • Transfer raw data to evaluation software • Work with standard software for data evaluation (e.g. Microsoft Excel) • Prepare standard graphs • Conduct appropriate data storage and backup	He/she knows about: • Principles for the Handling of Research Data • Use of different software solutions for data evaluation • Mean Values and deviations • Basic Statistic and data transformation
Competence Level B	He/she is able to: • Apply and interpret mean values, standard deviation • Apply and interpret appropriate regression functions • Choose appropriate statistic calculations • Choose appropriate data transformation if necessary	He/she is able to: • Prepare appropriate graphs depending on nature of data • Calculate means and deviations • Calculate regression functions • Conduct statistic and data transformation processes	

Work task	**Competence Level**
Transfer raw data to evaluation software	A
Preparation of standard graphs	A
Calculations on data (Mean values, standard deviation, regression functions)	B
Data transformation and statistics	B
Preparation of advanced graphs and of presentations	B

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