1- Module title : Wine Microbiology and Fermentations – 3 ECTS

Key words : Wine yeast, bacteria, alc. fermentation, malolactic fermentation, gene technology

Core module

2- Module leader(s) & guest lecturer(s)/expert(s) :
Prof. Manfred Grossmann
Prof. Bruno Blondin
Prof. Doris Rauhut
Prof. Isabelle Mas-Neuf

3- Main contact(s) for pedagogical queries :
Name : Prof. Manfred Grossmann
Phone : +49 (0)6722/502-331
Fax: +49 (0)6722/502-330
E-mail : manfred.grossmann@fa-gm.de

4-Module objectives : (knowledge/skills acquisition)
- metabolism of yeast and bacteria relevant for wine making (alcoholic & malolactic fermentations),
- populations dynamics during fermentation processes (AF & MLF), also comparing spontaneous fermentation with usage of microbial starter cultures
- impact of yeast and bacteria nutrient on course of fermentation and formation of positive and negative aroma compounds
- selection procedures for yeast and bacteria
- impact factors on fermentations
- construction of genetically engineered wine yeasts and their properties
- microbial spoilage of grapes, must and wine,
- lagging and stuck fermentations and problem solving operations

5- Pre-requisites : (disciplinary bases)
Basic knowledge in:
- cytology of prokaryotic and eukaryotic cells
- organic chemistry and biochemistry
- principal wine making techniques

6- Methodology : (pedagogical approach, types of activities, load of personal work...)
- lectures; case studies of fermentation behaviours
Students will elaborate and substantiate module topics through self study of recommended literature (about 1/3 of total work load).

7- Module contents:
Yeast cell biology and taxonomy, carbon metabolism and by-products of fermentations, fermentation cycle.
Yeast physiology, nutrition and stress factors.
Lactic acid bacteria: taxonomy, metabolism, nitrogen and oxygen management.
Wine spoilage by yeast and bacteria
Genetic improvement of wine yeast and risk assessment
Nutritional demands of yeasts and strain differences.
Nitrogen and sulphur metabolism; sulfite production and sulfite management
Role and effects of fermentation additives on fermentation performance
Targeted impact of yeast and bacteria on wine flavour
Spontaneous fermentations versus usage of starter cultures; selection scheme for starters.
Control of fermentation and strategies to avoid stuck fermentations or fermentation restart

8- Bibliography /references /journals & internet sources of information:
(literature that students will have to read within their personal workload)
- Students will receive all Power point presentations and literature used for their creation
- In addition for overall information:
  Fleet, G.H. Wine Microbiology and Biotechnology
  Ribéreau-Gayon, P. et al.: Handbook of Enology Vol
  Biology of Microorganisms on Grapes, in Must and in Wine, König, Helmut; Unden, Gottfried; Fröhlich, Jürgen (Eds.) 2009, Internet search by using PubMed

9- Module assignment(s) / assessment(s) / evaluation:
written assignment