# Schedule of the Course (Bioethanol production – process design aspects)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Monday** | **Tuesday** | **Wednesday** | **Thursday** | **Friday** |
| **9-11** | Introduction: Biofuel production - First and second generation ethanol production technologies  (1-hour lecture)  Basics of flowsheeting:  -Heat exchange  -V-L equilibrium | -Design specification  -Evaporation  -Handling of solids  (computer seminar) | Techno-economic assessment of biorefinery processes  (1-hour lecture)  Introduction of the group project  (computer seminar) | Group project work  (computer seminar) | Group project work  (computer seminar)  12.00 Closure of the course |
| **11-11.30** | Break | Break | Break | Break |
| **11.30-13** | -Fermentation  -Distillation  -Sensitivity analysis  (computer seminar) | -Calculator  (computer seminar) | Group project work  (computer seminar) | Group project work  (computer seminar) |
| **13-14** | Aspen exercises (optional individual work with assistance) | Aspen exercises (optional individual work with assistance) |

1) The course starts with a review of the bioethanol production technologies. Then the basics of Aspen Plus flowsheeting will be presented using the software. We will learn:

-how to develop a simple process model including general unit operations, e.g. heat exchanger, bioreactor, distillation column

-how to use the calculation tools of Aspen Plus: a) sensitivity analysis, b) design specification, c) calculator

2) We will model a lignocellulosic-ethanol process including steam pretreatment, enzymatic hydrolysis, ethanol fermentation and distillation.

3) We will discuss the treatment options of the stillage.

4) Finally, the basics of heat integration and economic analysis will be presented.