UNIVERSITY OF PANNONIA

COURSE DATASHEET

Semester:	2015/16/2
Course:	Product design
Code:	VEMKTEV246T
Responsible department:	Department of Hydrocarbon and Coal Processing
Department code:	MKOL
Responsible instructor:	András Holló

Course objectives:

The objective is to review the aspects of the modern chemical product design and acquire the method of practical realization

Course content:

1. Place and role of product design in the chemistry and in the training of chemical engineers (definition, necessity and importance of chemical product design)

2. Process of the product design (demands, possibilities, selection, production, quality control etc.)

3. Demands (measure of consumer demands and definition of those), characteristic properties, given and evaluation of concrete data, (milestone I.)

4. Possibilities (initial conception, from idea to product; the source of ideas: literature including patents, conception of developers and user, external experts)

5. Possibilities to solve problems, exploration of chemistry of idea and extraction possibilities (from natural material); accidental structural recognition, combinatory chemistry)

6. Classification and pre-qualification of idea; aspects of pre-selection: scientific grounding, engineering approach, lowest risk; selection of best solutions: low cost, safety, harmful environmental effect as low as possible (milestone II.)

7. Selection, necessity of selection matrix

8. Obfejtiv factrors of selection: thermodynamic, kinetic (reaction rate, mass and heat transport) properties etc.; less objective factors (new or upgraded product); subjective factors (effect of product on sense-organs of customer: noise, humidity, feeling of cold)

9. Risks at product selection; multitude of risk (recognition and categorization, estimation with engineering approach); comparison of risks of possible products; risk management (risk decrease at product development, condidering and handling of risk; (milestone III.)

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Course content:

10.
Product production (intellectual property: patents, step of patenting process, commercial privacy)

11.
Acquisition of supplementary information (reaction route, etc.); final properties (structure of product: chemical composition, measures, chemical reactions, thermodynamic properties of product); most important product characteristics: structure: solidity, flexibility, equilibrium states: changing temperature, pH, rate of key processes, heat transfer, flow properties, diffusion; chemical and physical effects

12.
Special products, like micro-structured products (thermodynamics, colloid stability, rheology and mixing, reaction kinetics).

13.
Chemical processes, manufacturing equipments

14.
Economical considerations (mass products, special products), economy of process (economic potential, investment requirements), economy of products, cash-flow, market share (milestone IV.)

Detailed content of the laboratory practise

1.
Determination of LPG composition and octane number. Gasoline tests (density, Engler distillation, determination of ETBE content of gasoline)

2.
Determination of LPG composition and octane number. Gasoline tests (density, Engler distillation, determination of ETBE content of gasoline)

3.
Determination of LPG composition and octane number. Gasoline tests (density, Engler distillation, determination of ETBE content of gasoline)

4.
Gasoil tests (density, aniline point, closed cup flash point, CFPP, hydrocarbon group composition /IR/, sulphur content)

5.
Gasoil tests (density, aniline point, closed cup flash point, CFPP, hydrocarbon group composition /IR/, sulphur content)

6.

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Course content:

Lube oil tests (density, refraction index, kinematical viscosity at 40 and 100°C, open cup flash point, ASTM number, acid number, pour point, hydrocarbon group composition, Conradson number)

7. Lube oil tests (density, refraction index, kinematical viscosity at 40 and 100°C, open cup flash point, ASTM number, acid number, pour point, hydrocarbon group composition, Conradson number)

8. Lube oil tests (density, refraction index, kinematical viscosity at 40 and 100°C, open cup flash point, ASTM number, acid number, pour point, hydrocarbon group composition, Conradson number)

9. Paraffin tests. Bitumen tests.

10. Lube grease tests.

11. Heating oil tests.

12. Polymer tests – viscosity and viscosity index improvers

13. Polymer tests – polymer fibres

14. Polymer tests – plastics, final labour report

Requirements, evaluation and grading:

Preparation of design project at deadline and successful presentation in the semester about design project. Exam paper has to be at least 50%, which is 55% of the grade.

Detailed content of the laboratory practise

Requirements:
The laboratory part-grade determined by the accuracy of experimental results (70%) and final labour report (30%), which has to be at least 50%. It is 45% of the grade.

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Requirements, evaluation and grading:

Possibilities for repeating the subject:
Agreed with the course chief

Learning efforts necessary to satisfy the requirements of the subject:
Preparation of design project.
Total 84 hour óra, hereof:

- Contact time: 28 hour
- Personal product design project: 14 hour
- Laboratory practise: 42 hour

Required and recommended readings:

Cussler, E. L.; Moggridge, G. D.:"Chemical Product Design"Cambridge University Press, 2001. Ulrich, K. T., and S. D. Eppinger, Product Design and Development, Second Edition, McGraw-Hill, 2000. Moggridge, G. D.; Cussler, E. L.:" An Introduction to Chemical Product Design", Trans IChemE 2000, 78, 5-11. Weissermel, K., Arpe, H.J.: Ipari szerves kémia, Nemzeti Tankönyvkiadó, Budapest, 2003. Gary, J.H.: Petroleum Refining Technology and Economics 3rd , Marcel Dekker, N.Y. 1999. Speight,J.G.: The chemistry and technology of petroleum 3rd . Marcell Dekker, 1998. Speight,J.G.: Petroleum Chemistry and Refining, Taylor and Francis 1998. Sequeira, A.: Lubricant base oil and wax processing, Marcell Dekker, 1994. Weissermel, K., Arpe, H-J.: Ipari szerves kémia, Nemzeti Tankönyvkiadó, Budapest, 1993. Mc Ketta, J.: Petroleum Processing Handbook, Marcell Dekker, 1992. Hobson, G.D.: Modern Petroleum Technology, J. Wiley, 1986. Chauvel, A., Lefevbre, G.: Petrochemical processes I-II., 1989. Fahey, D.R.: Industrial Chemicals via C1 Processes, A.C.S., 1986. Wiseman, P.: Petrochemicals, John Wiley, N.Y.,1986. Meyers, R.A.: Handbook of petroleum Refining Processes, McGraw-Hill Inc., N.Y., Toronto, 1996. Chauvel,A, Lefebre,G.: Petrochemical processes I-II. Gulf. 1989. Krevelen, D.W.Van.: Properties of polymers, Elsevier, Amsterdam,…, Tokyo, 1990. Fourné, F.: Synthetic Fibers, Hanser Publishers, Munich 1999. Gunardson, H.: Industrial Gases in Petrochemical processing, Marcel Dekker Inc.,1998. Scheirs, J., Kaminsky, W.: Metallocen based Polyolefins, preparation, properties and technology Vol.1, John Wiley and Sons, Ltd., 2000. Olah, G.A., Molnár, Á.: Hydrocarbon chemistry, John Wiley and Sons, Inc., 1995. Hancsók Jenő: Korszerű motor és sugárhajtómű üzemanyagok, Tankönyvek, I. Motorbenzinek (1997), II. Dízelgázolajok (1999), Alternatív motorhajtóanyagok (2004).