



## COURSE DATASHEET

<b>Semester:</b>	2012/13/2
<b>Course:</b>	Liquid crystals: Fundamentals and applications
<b>Code:</b>	VEMKFISV12D
<b>Responsible department:</b>	Institute of Physics and Mechatronics
<b>Department code:</b>	MKFI
<b>Responsible instructor:</b>	dr. Szabolcs Varga

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### Course objectives:

The main objectives of this course to provide a comprehensive overview of mechanical, thermodynamic and optical properties of liquid crystals.

### Course content:

1. Basic quantities. Fundamental phases. Classification of liquid crystals (LC): thermotropic and lyotropic LC, calamatic and discotic LC. Phase transitions in LC. 2. Mesophases in calamatic and discotic LCs: nematic, smectic, cholesteric, plastic ...etc. phases. 3. Exotic mesophases: biaxial nematic, ferronematic, blue, twist grain boundary .. etc phases. 4. Orientational and positional ordering: order parameters and correlation functions. 5. Models of liquid crystals and basic theories. Phenomenological and statistical theories. 6. Molecular simulation of liquid crystals (Molecular dynamics, Monte Carlo) 7. Mixtures of liquid crystals. Colloidal and polymeric LC. Biological systems. 8. Electric and magnetic effects in liquid crystals. Nematic director. Freederiks-transition. 9. Mechanical properties: twist, bend and splay 10. Optical, dielectric and magnetic anisotropy. Optical birefringence and ordering. Propagation of light in twisted nematic phase. 11. Practical applications: thermometers, optical switches, display. 12. Fundamentals of liquid crystal displays (LCD). 13. Classification of LCD: passive and active matrix displays. Comparison of LCD with CRT monitors. 14. LCD technology. New materials in LCD technology: SSFLC, PDLC. 15. Summary

### Requirements, evaluation and grading:

exam

### Required and recommended readings:

P. J. Collings: Liquid Crystals, second edition, Princeton University Press, (2002) G. Vertogen, W. H. de Jeu: Thermotropic Liquid Crystals, Fundamentals, Springer-Verlag, (1988). Bata L.: Folyadékkristályok (Muszaki Könyvkiadó, Budapest 1986). P.G. de Gennes J. Prost: The Physics of Liquid Crystals, second edition, Oxford University Press, (1994) S. Chandrasekhar: Liquid Crystals, second edition, Cambridge University Press, (1992)