UNIVERSITY OF BUCHAREST
FACULTY OF CHEMISTRY

MASTER TOPICS: ***Chemistry of advanced materials***

SYLLABUS

Course name: Micro- and nano-structured polymer-based materials. Thermal analysis.
Lecturers: assist. prof. dr.Marin Micut and assist. prof. dr. Bogdan Jurca
Course duration: 28 hours
Laboratory/seminar activity duration: 28 hours
Credits: 5
Evaluation form: examination (50% Micro- and nano-structured polymer-based materials; 50% Thermal analysis)

Course

Course number	Topics of the course	Duration (hours)
1	Defining micro- and nano-scale level in obtaining structured materials. General and particular characteristics on top-down and bottom-up technologies in fabrication of micro- and nano-structured materials	2
2	Thermodynamic stability of polymer solutions	2
3	Phase separation – a suitable method to built micro- and nano-structured polymer film	2
4	Binodal and spinodal curves. Obtaining the micro- and nano-structures by spinodal decomposition	2
5	Nanostructures resulted by self-assembly of block copolymers	2
6	Miniemulsion polymerisation and synthesis of polymer nanoparticles	2
7	Polymer-based biomaterials for tissue engineering	2
8	Fundamentals of thermal analysis (TG, DTA and DSC)	3
9	Evaluation of thermal and thermooxidative stability (determination of succesive degradation steps) of materials in dynamic temperature conditions.	3
10	Thermokinetic studies (from DSC, TG and DTA data) of chemical reactions involving solid state phases.	4
11	Use of kinetic parameters to evaluate materials stability and aging in specific conditions.	2
12	Applications of DSC, TG and DTA as coupled techniques for complex studies of materials used in various domains (industry, medicine, biology, etc.)**.**	2

Laboratory/Seminar

Lab. number	Topics of the laboratory/seminar activity	Duration (hours)
1	Laboratory work safety and fire protection. Kinetics of *in vitro* fibrillogenesis of collagen type I	**4**
2	Obtaining nanoparticles by miniemulsion polymerization of methyl methacrylate	**4**

3	Photonic crystals by cuasistatic adsorbption of monodispersed polymer particles onto glass substrate	**4**
4	Viscoelastic properties of a polymer hydrogel by oscillatory rheometry	**2**
5	Presentation of thermal analysis equipment. Experimental study of thermal decomposition of calcium oxalate. Interpretation of experimental results.	**4**
6	Study of thermal decomposition of polyvinyl chloride using TG, DTG and DTA techniques. Determination of kinetic parameters using differential and integral methods based on single heating rate data.	**4**
7	Determination of kinetic parameters for polyvinyl chloride thermal decomposition using multiple experiment data (isoconversional differential and integral methods).	**4**
8	Correlation of the results obtained for polyvinyl chloride thermal decomposition by coupled techniques.	**2**