

SSD: CHIM/06

Academic year: **2016/17**

Faculty: **Department of Chemistry**

Study courses: **Organic Chemistry 3**

Study plans/Curricula: **Master Degree in Chemical Sciences**

Type: **Activities characterizing the class (type b)**

Total Credits: **6**

Didactic Methods: **Lectures and exercises**

Language of the course: **Italian**

Didactic Period: **2° year - 1° semester (October – January)**

Exam type: **Oral**

Professor in charge: **ANGELO NACCI**

Training objectives: **To complete the cultural background of the Master Chemist by means of an overview of the basic and advanced methodologies of organic synthesis, together with the discussion on categories of organic compounds of practical relevance such as polymers and pesticides.**

Prerequisites: **Basic concepts of organic chemistry of bachelor degree**

Didactic Methods: **Classroom power point lectures and exercises at the blackboard**

Course programme

ASYMMETRIC SYNTHESIS. Types of chirality. Enantiomeric excess. Racemic resolution. Felkin-Ahn model. SAMP-RAMP, Meyers oxazoline, enantioselective hydrogenation and Sharpless epoxidation.

CROSS-COUPLING REACTIONS. Catalytic cycles and synthetic applications of Heck, Suzuki, Stille, Negishi, Sonogashira. Regio- and stereo-chemical aspects. Domino reactions. Pd(II)-catalysed reactions.

SULFUR AND PHOSPHOROUS ORGANIC COMPOUNDS. Structure, nomenclature and main synthetic applications.

COMBINATORIAL CHEMISTRY AND SOLID PHASE SYNTHESIS. Chemical diversity and drug-like molecules. Merrifield synthesis of peptides. Protecting groups. HTS assays. Libraries synthesis. Mix and split method. Screening strategies. REC chemistry. Deconvolution. Phage display. Parallel synthesis. Gel resins and linkers. Swelling, Bead capacity.

SUPERCRITICAL FLUIDS. Termodinamics of SC fluids. Density/solubility Relationship. Cosolvents and entrainers. Main applicazioni of SCF:

MICROWAVES IN ORGANIC CHEMISTRY. Main applications fields of MW. Action mechanism. Ionic and dipolar polarization. Relative permittivity ϵ' and loss angle ϵ'' . Specific effects of MW on organic reactions and their dependence on the reaction mechanism.

POLYMERS. Nomenclature. Molecular weights. Classifications. Fibers, elastomerers and plastics. Thermoplastic and thermoset polymers. Amorphous and crystalline polymers. Glass transition. Curing. Condensation polymers: polyamides, polyesters, polycarbonates, polyurethanes and epoxy resins. Addition polymerization mechanism: LDPE and HDPE. Ziegler-Natta catalyst. Main types of plastic working.

TOXIC ORGANIC COMPOUNDS. ADI e NOEL and LD50. Pesticides. Insecticides. Pyrethrins. DDT and analogous. Bioconcentration and biomagnification (Kow and BCF). Organophosphorous and

carbamate pesticides. Ureic, triazinic and phenoxyacetic acid herbicides. Dioxins. Fungicides. PCB and IPA.

Exercises in classroom on asymmetric organic synthesis and cross-couplings.

Reference Texts. Handouts and lecture notes.