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TM15_DIP_FAR

Teach Mob – Visiting Professors
Academic year 2016/2017

2nd Term
COURSE TITLE **Pharmaceutical Process Development**
Scientific area **Medicinal Chemistry and Organic Chemistry**
Department of Drug Science and Technology
Language used to teach: English
Teaching Commitment: 24 hours
Course summary Process development in green synthetic chemistry. Control of chemical reactions hazards. Safety aspects, sustainability, atom economy and process intensification. Reagents, solvents and catalysts suitable for scaling up. Innovative synthetic strategies and applications with low environmental impact and low energy consumption. Solvent-free processes. In-process assays, in-process controls and specifications. Process analytical technology. Practical considerations for scale-up: optimizing processes through control of physical parameters. Workup of large scale reactions: extraction, crystallization chromatography. Handling and isolation of reaction products. Final products and impurities. Continous operation. Process monitoring and industrial purification techniques. Non conventional synthetic techniques of industrial application: extraction and synthesis under acoustic (ultrasound) or hydrodynamic cavitation, mechanochemistry (ball mills), flow chemistry and hybrid techniques. Micellar catalysis in water and glycerol. Nanoparticles synthesis and characterization (XPS, TEM etc.). Chemistry and catalysis in non-conventional solvents. Multicomponent reactions. Case Studies.
Learning objectives At the end of this course students will have learnt the main concepts necessary to operate in a process development laboratory. Enabling technologies in synthetic chemistry, principles of green chemistry, definition and strategies of process intensification, limits and advantages of the main non conventional techniques, scaling up procedures, risk and safety analysis. Students will be able to evidence and control the principal parameters associated with the planning of a large scale chemical process, with particular emphasis on safety, chemistry, and economy of route selection. Students will also be introduced to the application of modern technologies in process development, and process sustainability.
Tutorship activities Few experimental thesis of Master students and PhD students should be co-tutored by the visiting professor. The aim of their research is to design new highly efficient synthetic processes for structurally diverse lead hits libraries. The skills of the visiting professor will be critical to identify the best technique in term of process efficiency, environmental impact and industrial scalability.
Lab activities Synthesis of lead compounds under green conditions and different energy sources and techniques.

Multicomponent reactions. Discussion with students of strategies, processes and purifications. Process evaluation and full analytical characterization. Transition-metal catalysis: Au, Pt, Ir, Cu, Pd, Ru, Fe and micellar catalysis in water and glycerol.

Other activities besides the course: i.e. seminars and conferences addressed to PhD students and research fellows, dissemination conferences

Visiting professor will present seminars and conferences for Ms and PhD students. Specific session for teaching staff will be focused on future joint projects for competitive grant applications.

Visiting Professor Profile

Expertise on novel methodologies in Green Chemistry for the Synthesis of fine chemicals, small heterocycles, peptides, nucleosides and biomolecules. Experience on activation techniques: ball-mill, microwaves, ultrasound, hydrid microwaves-ultrasound techniques, continuous flow. Experience on green solvents and solvent-free reactions. Nanoparticles synthesis and characterization (XPS, TEM…).

Contact person at the Department

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