Approval: 4th Senate Meeting

Course Name	: Reagents in organic synthesis
Course Number	: CY-645
Credit	: 3-0-0-3
Prerequisites	: Basic knowledge in organic reaction and mechanism
Students intended for	: PhD
Elective or Compulsory	: Elective
Semester	: Odd/Even

Preamble: The course will discuss about some of the important reagents, including the reagents developed in recent year, which are widely used in organic synthesis. The course will also talk about the handling practice of these reagents particularly the kind of precaution one needs to take while using these reagents. A detail discussion will help the students to understand how little modification in reagents' chemical structure affects the selectivity/reactivity of the reagents. Preparation procedure of these reagents will also be discussed. In addition, the utilization of these reagents in synthesizing natural products, drug candidates, asymmetric molecules and materials with wide application will also be discussed in detail.

Course Outline: Classification of reagents; about air and moisture sensitive reagents; handling, storage and precaution; synthesis of various oxidizing and reducing reagents; application in the synthesis of natural products, in organic transformation and in asymmetric synthesis; sdvantages and disadvantages of solid supported reagents; various inorganic supports and their application in organic reaction; effect of support materials on reactivity; organic supports including polymeric resins, their functionalization and application; various types of hypervalent iodine reagents and their preparation; application in organic transformation, selectivity, sensitivity and reactivity; phosphonium, immonium, imidazolium, carbodiimide, uronium, organophosphorous, chloroformate and acid halogenating reagents; their applications; different types of protecting/masking agents; protection of chemical functionalities and their deprotection after completion of reaction; their application in chemo- and regioselective reaction; preparation of copper, palladium, platinum and ruthenium based coupling reagents; application in C-C, C-N, C-O and C-S bond forming reactions; their applications in asymmetric synthesis; applications of lanthanide reagentsin oxidation, reduction, C-C bond forming, cyclopropanation and cycloaddition reactions; synthesis and application of P, S, Se and Si-based reagents in organic synthesis.

Modules:

Introduction – Classification of reagents; about air and moisture sensitive reagents; handling, storage and precaution; (3 h)

Oxidising and reducing agents – Synthesis of various oxidizing and reducing reagents; application in the synthesis of natural products, in organic transformation and in asymmetric synthesis; (7 h)

Solid supported reagents – Advantages and disadvantages; various inorganic supports and their application in organic reaction; effect of support materials on reactivity; organic supports including polymeric resins, their functionalization and application. (7 h)

Hypervalent iodine reagents- Various types of hypervalent iodine reagents and their preparation; application in organic transformation, selectivity, sensitivity and reactivity (4 h)
Peptide couplingreagents- Phosphonium, immonium, imidazolium, carbodiimide, uronium, organophosphorous, chloroformate and acid halogenating reagents; their applications. (5 h)

Functional group protecting agents– Different types of protecting/masking agents; protection of chemical functionalities and their deprotection after completion of reaction; their application in chemo- and regioselective reaction (5 h)
Copper, palladium, platinum and ruthenium based coupling reagents– Preparation of Copper, palladium, platinum and ruthenium based coupling reagents; application in C-C, C-N, C-O and C-S bond forming reactions; their applications in asymmetric synthesis. (5 h)
Lanthanide reagents in organic synthesis – Applications in oxidation, reduction, C-C bond forming, cyclopropanation and cycloaddition reactions. (2 h)
P, S, Se and Si-based reagents – Synthesis and application in organic synthesis. (3 h)

Text & Reference Books:
Text book:

1. Name Reactions and Reagents in Organic Synthesis by Bradford P. Mundy, Michael G.
2. Palladium reagents in organic syntheses by Richard F HeckFavaloro

Reference books:

1. Encyclopedia of Reagents for Organic Synthesis
2. Fieser and Fieser's Reagents for Organic Synthesis
3. Handbook of Reagents for Organic Synthesis, Activating Agents and Protecting Groups by Anthony J. Pearson, William R. Roush
4. Handbook of Reagents for Organic Synthesis: Reagents for glycoside, nucleotide, and peptide synthesis by David Crich.
5. Handbook of Reagents for Organic Synthesis: Reagents for direct functionalization of C-H bonds by Philip L. Fuchs
6. Fluorine-Containing Reagents by Leo A. Paquette
7. Handbook of Reagents for Organic Synthesis: Reagents for high-throughput solid-phase and solution-phase organic synthesis by Peter Wipf
8. Protective groups in organic synthesis by Theodora W. Greene, Peter G. M. Wuts
9. Review articles on reagents from leading journals ofvx n¼ organic chemistry.