



### Metal Mediated Synthesis-I

Chemistry and Biochemistry

**Instructor Name:** Dr. Debabrata Maiti

**Institute:** IIT Bombay

**Department:** Chemistry and Biochemistry

**About Instructor:** Prof. Debabrata Maiti has done BSc (Chemistry), MSc (Chemistry, IIT B) and received his Ph.D. from Johns Hopkins University (USA) in 2008. After postdoctoral studies at Massachusetts Institute of Technology (MIT), he joined the Department of Chemistry at IIT Bombay in 2011. His research and teaching interests include organometallic chemistry, the development of new and sustainable synthetic methodologies and mechanistic insight.

**Pre Requisites:** : Advance Organic and Inorganic Chemistry

**Core/Elective:** : Core

**UG/PG:** : UG

**Industry Support** : All Pharmaceutical Industries

**Course Intro:** : The course covers an advance level of organometallic chemistry. Recent development of cross coupling reactions and their applications in organic synthesis, starting from small molecule to naturally and pharmaceutically important compounds, has been described in the prescribed course. In this course, a brief overview about the carbene chemistry and oxidative cyclization is also portrayed.

#### COURSE PLAN

SL.NO	Week	Module Name
1	1	Introduction, Assymmetric Hydrogenation
2	1	Transition metal carbenes, Fischer and Schrock carbenes
3	1	Reactivity of carbene complexes, Olefin metathesis, Dienealkyne metathesis, Carbonyl olefination, Assymmetric ring closing metathesis (RCM)
4	1	Alkyne metathesis, Tebbe's reagent: reactivity, mechanism and scope
5	1	Fischer carbene: Synthesis and reactivity, Cyclopropanation reaction
6	2	Catalytic cyclopropanation reaction, Introduction to cross coupling reaction
7	2	Trans metalation, Kumada Coupling reaction, Introduction to Suzuki coupling reaction
8	2	Details about Suzuki reaction Carbonylative Suzuki reactions Introduction to Negishi coupling reaction



9	2	Stille coupling reaction, Problems associated with the use of alkyl halide as the coupling partner and its solution
10	2	Ni catalyzed Suzuki reaction, Asymmetric Suzuki coupling reaction
11	3	Sonogashira coupling reaction: Mechanism and scope, Heck coupling reaction: Mechanism and scope
12	3	Regioselectivity of Heck reaction
13	3	Introduction to transition metal catalyzed carbon-hetero atom bond formation reaction: Buchwald-Hartwig coupling reaction
14	3	Buchwald-Hartwig coupling reaction: mechanism and scope of the reaction, Role of Ligand in Buchwald-Hartwig coupling reaction
15	3	Role of biarylphosphine ligand and its influence in Buchwald-Hartwig coupling reaction
16	4	Role of ligand and the mechanistic insight about the Buchwald-Hartwig coupling reaction, Oxidative cyclization process
17	4	Detailed mechanistic study of oxidative cyclization and their implication in natural product synthesis
18	4	Synthesis of reactive metallacycle intermediate via beta-abstracton and their applications
19	4	Cyclo butene formation via oxidative cyclization method, Kulinkovich Reaction and its mechanism, Pauson-Khand reaction and its mechanism
20	4	Pauson-Khand reaction: Regiochemistry, scope, application in natural product synthesis and asymmetric version of this method