Department of Chemistry
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE OUTLINE TEMPLATE			
Course Title	**Organometallic and Bioinorganic Chemistry**		
Course Code	**CH 604**	**No. of Credits**	**3 (Theory)**
Department	**Chemistry**	**Faculty**	**Dr. G.Venkatesa Prabhu**
Programme	**M.Sc.(Chemistry)**		
Pre-requisites Course Code	**NIL**		
Course Coordinator(s) (if, applicable)	**Dr. G.Venkatesa Prabhu**		
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Course Type	☑ **Core course**	☐ **Elective course**	

COURSE OVERVIEW

This course is offered to I year M.Sc.(Chemistry) students. This 3 credit course is for theory. Three theory classes will be conducted per week.

COURSE OBJECTIVE

To introduce the basic principles involved in the Structure and bonding in organometallics, important reaction mechanisms and role of metal ions the biological system.

COURSE OUTCOMES (CO)

Students would become familiar with the:

- ✓ Fundamentals of structure and bondind in organometallic compounds.
- ✓ Reaction mechanism and catalysis
- ✓ Carbenes and Transport of metal ions across cell membranes
- ✓ Metalloporphyrins and metalloenzymes.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week	Topic	Mode of Delivery
1	I week of January	**Unit-I :** 18/16-electron rule - metal carbonyls – bonding–spectra –nitrosyls - dinitrogen complexes –phosphines	C&T, PPT
2	II week of January	Metal alkyls, aryls, hydrides and dihydrogen complexes - -bonding ligands –metallocenes - electronic structure and bonding in ferrocene -	C&T, PPT
3	III week of January	Synthesis,physicaland spectroscopic properties of metallocenes - fluxional molecules.	C&T, PPT
4	IV week of January	**Unit-II** Ligand substitution - oxidative addition and reductive elimination - 1,1 and 1,2-insertion - addition and elimination reactions - alkene isomerization-	C&T, PPT

5	I week of February	Hydroboration - hydrocyanation - hydrogenation of olefins - Wilkinson's- cat hydroformylation of olefins - Wacker-Smidt synthesis	C&T, PPT
6	II week of February	Monsanto acetic acid process - Eastman Halcon process - Fischer-Tropsch process – hydrosilylation	C&T, PPT
7	III week of February	**Unit-III** Fischer and Schrock carbenes - bonding & reactivity - Grubbs catalyst - carbynes structure, synthesis and reactions	C&T, PPT
8	IV week of February	Alkene metathesis –mechanism - RCM-ROMP, SHOP and ADMET - C-H and C-C activation - agostic bonds	C&T, PPT
9	I week of March	Ziegler-Natta polymerization of olefins - Heck reaction - The Pauson Khand reaction - Ene reaction.	C&T, PPT
10	II week of March	**Unit-IV** Transport and storage of metal ions by organisms - structure and functions of biological membranes -	C&T, PPT
11	III week of March	Generation of concentration gradients (the Na^+-K^+ pump) - mechanisms of ion-transport across cell membranes –bleomycin - siderophores (e.g. enterobactin and desferrioxamine)	C&T, PPT
12	IV week of March	Transport of iron by transferring - storage of iron by ferritin - bio chemistry of calcium as hormonal messenger.	C&T, PPT
13	I week of April	**Unit-V** Dioxygen transport and storage - hemoglobin and myoglobin: electronic and spatial structures - hemeythrin and hemocyanine - synthetic oxygen carriers, model systems	C&T, PPT
14	II week of April	Blue copper proteins (Cu) - iron-sulfur proteins (Fe)-cytrochromes electron transport chain - carbon monoxide poisoning - iron enzymes - peroxidase, catalase and cytochrome P-450, copper enzymes	C&T, PPT
15	III week of April	Superoxide dismutase, vitamin B12 and B12 coenzymes, photosynthesis - photosystem-I & II, nitrogen fixation, cisplatin.	C&T, PPT

COURSE ASSESSMENT METHODS				
S.No.	**Mode of Assessment**	**Week/Date**	**Duration**	**% Weightage**
1	Assignment	II Week of February	Depends on the activity	5
2	Test I	IV Week of February	60 minutes	20
3	Seminar	IV week of March	Depends on the activity	5
4	Test II	I Week of April	60 minutes	20
5	End semester	IV week of April	3 hours	50
Theory = Total (100)				

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

References:

1. R.H. Crabtree, The Organometallic Chemistry of Transition Metals, 4th Edn Wiley-VCH.
2. G.O. Spessard and G. L. Miessler, Organometallic Chemistry, 2nd Edn, Oxford University Press.
3. S. J. Lippard & J. M. Berg. Principles of Bioinorganic Chemistry, Panima Publ. Corpn. (2005).
4. W. Kaim & B. Schwederski. Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life, John Wiley (1994).
5. J. E. Huheey, E. A. Keiter and R. L. Keiter, Inorganic Chemistry, Principles of Structure and Reactivity, 4th Edition, Harper Collin College Publishers, 1993.
6. J. P. Collman, Principles and Applications of Organotransition Metal Chemistry, Standford University.
7. S. E. Kegley and A. R. Pinhas, Problems and Solutions in Organometallic Chemistry, University Science Books.
8. C. Elschenbroich, Organometallics, 3rd Edn, Wiely VCH.
9. J. F. Hartwig, Organotransition Metal Chemistry: From Bonding to Catalysis, 1st Ed, University Science Books, 2010

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

1. Feedback from students during class committee meetings.
2. Anonymous feedback through questionnaire at the end of the semester.

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

1. 75% attendance is compulsory for Theory component.
2. Theory:
   A. For those who missed Test I and Test II due to genuine reasons, retest will be conducted during the III week of April 2017.

ADDITIONAL COURSE INFORMATION

The faculty will be available for consultation at times as per the intimation by the faculty.

Coordinator _____ **CC-Chairperson** _____ **HOD** _____

2/1/2017 4/1/17