

## Indian Institute of Technology Guwahati

### Proposal for a New Course

<b>Course Number &amp; Title:</b> CH1101-05H Basic Inorganic Chemistry	
<b>L-T-P-C:</b> 3-0-0-3	
Type of Letter Grading (Regular Letter Grades / PP or NP Letter Grades): Regular Letter Grades	
Kind of Proposal (New Course / Revision of Existing Course): New Course	
Offered as (Compulsory / Elective): Compulsory	
Offered to: BTech (BT, MC, CL, EPH, EN)	
Offered in (Odd/ Even / Any): Odd	
Offered by (Name of Department/ Center): Chemistry	
<b>Pre-Requisite:</b> None	
<b>Preamble / Objectives (Optional):</b> The course is designed to teach fundamental inorganic chemistry.	
<b>Course Content/ Syllabus:</b> Chemical Bonding: Chemical Bonding: Ionic, Covalent, and Metallic. Molecular Orbital Theory for Polyatomic Molecules. Solid State Chemistry and Materials: Crystallography and Defects in Solids, Electronic Properties of Solids and Band Theory. Metal silicates, Zeolites, metals and alloys, ceramic materials. Coordination compounds. Bioinorganic and organometallic chemistry. Phosphorus and Nitrogen compounds.	
Books (In case UG compulsory courses, please give it as "Text books" and "Reference books". Otherwise give it as "References".	
Texts: (Format: Authors, <i>Book Title in Italics font</i> , Volume/Series, Edition Number, Publisher, Year.)	
1.	F. A. Cotton, and G. Wilkinson, <i>Advanced Inorganic Chemistry</i> , 5th Ed., Wiley, 1999.
2.	D. J. Shriver, P. W. Atkins, and C. H. Langford, <i>Inorganic Chemistry</i> , 5 <sup>th</sup> Ed., Oxford University Press, 2010.
References: (Format: Authors, <i>Book Title in Italics font</i> , Volume/Series, Edition Number, Publisher, Year.)	
1	J. E. Huheey, E. A. Keiter and R. L. Keiter, <i>Inorganic Chemistry: Principle, structure and reactivity</i> , 4 <sup>th</sup> Ed., Harper Collins, 1993.

<b>Course Number &amp; Title:</b> CH1106-08H Basic Organic Chemistry	
<b>L-T-P-C:</b> 3-0-0-3	
Type of Letter Grading (Regular Letter Grades / PP or NP Letter Grades): Regular Letter Grades	
Kind of Proposal (New Course / Revision of Existing Course): New Course	
Offered as (Compulsory / Elective): Compulsory	
Offered to: BTech (BT, MC, CL)	
Offered in (Odd/ Even / Any): Odd	
Offered by (Name of Department/ Center): Chemistry	

<b>Pre-Requisite:</b> None	
<b>Preamble / Objectives (Optional):</b> The course is designed to teach fundamental organic chemistry.	
<b>Course Content/ Syllabus:</b> Fundamentals of Organic Chemistry: Functional groups and their significance; Isomerism: structural and stereoisomerism. Alkanes, Cycloalkanes, and Alkenes: Conformational analysis of cyclohexane; Structure, bonding. Basic Polymer Chemistry and Synthesis. Oxygen-Containing Compounds: Alcohols, ethers, and phenols; Structure and nomenclature of ethers; Acidity and reactions of phenols; Aldehydes and ketones: Structure, reactivity, and nucleophilic addition reactions; Aldol condensation. Carboxylic Acids, Derivatives, and Aromatic Compounds: Structure and acidity of carboxylic acids; Nucleophilic acyl substitution reactions; Electrophilic aromatic substitution reactions; Reactions of substituted benzenes.	
Books (In case UG compulsory courses, please give it as "Text books" and "Reference books". Otherwise give it as "References".	
Texts: (Format: Authors, <i>Book Title in Italics font</i> , Volume/Series, Edition Number, Publisher, Year.)	
1.	H. Pine, <i>Organic Chemistry</i> , 5 <sup>th</sup> Ed, McGraw-Hill, 1987.
2.	I. L. Finar, <i>Organic Chemistry</i> , Volume 1, Ed. 6, Pearson Education, 2009.
References: (Format: Authors, <i>Book Title in Italics font</i> , Volume/Series, Edition Number, Publisher, Year.)	
1	L. G. Wade (Jr.), <i>Organic Chemistry</i> , 8 <sup>th</sup> Ed. Prentice Hall, 2011.

<b>Course Number &amp; Title: CH1109-11 Chemistry Laboratory</b>	
<b>L-T-P-C:</b> 0-0-3-3	
Type of Letter Grading (Regular Letter Grades / PP or NP Letter Grades): Regular Letter Grades	
Kind of Proposal (New Course / Revision of Existing Course): New Course	
Offered as (Compulsory / Elective): Compulsory	
Offered to: BTech (CL)	
Offered in (Odd/ Even / Any): Odd	
Offered by (Name of Department/ Center): Chemistry	
<b>Pre-Requisite:</b> None	
<b>Preamble / Objectives (Optional):</b> The practical course is designed to teach different fundamental chemistry experimental techniques.	
<b>Course Content/ Syllabus:</b> Familiarization with Chemistry laboratory practice, safety, health, and environmental issues. Standardization of KMnO <sub>4</sub> by Oxalic acid. Reaction of 4-Aminotoluene and o-Vanillin - Preparation of Azomethine. Transesterification reaction - Synthesis of Biodiesel. Synthesis and characterization of tris(acetylacetonato)-manganese(III). Determination of the dissociation constant of a weak acid using pH meter. Conductometric titration of a strong acid with a strong base. Determination of the total hardness of water by complexometric titration.	

Preparation of a Detergent.	
Books (In case UG compulsory courses, please give it as "Text books" and "Reference books". Otherwise give it as "References".	
Texts: (Format: Authors, <i>Book Title in Italics font</i> , Volume/Series, Edition Number, Publisher, Year.)	
1.	V. K. Ahluwalia, S. Dhingra, A. Gulati, <i>College Practical Chemistry</i> . Universities Press (India) Pvt. Ltd. 2005.

<b>Course Number &amp; Title: CH1112 Organic Chemistry</b>	
<b>L-T-P-C:</b> 3-0-0-6	
Type of Letter Grading (Regular Letter Grades / PP or NP Letter Grades): Regular Letter Grades	
Kind of Proposal (New Course / Revision of Existing Course): New Course	
Offered as (Compulsory / Elective): Compulsory	
Offered to: BTech (CST)	
Offered in (Odd/ Even / Any): Odd	
Offered by (Name of Department/ Center): Chemistry	
<b>Pre-Requisite:</b> None	
<b>Preamble / Objectives (Optional):</b> The course is designed to provide in-depth knowledge of Organic Chemistry.	
<b>Course Content/ Syllabus:</b> Introduction to types of organic reactions; Structure and stability of reactive intermediates: carbocations, carbanions, free radicals, carbenes, arynes and nitrenes; Methods of determining organic reaction mechanism: thermodynamic and kinetic requirements, transition state theory, Hammond postulate, Curtin-Hammett principle, kinetic vs. thermodynamic control reaction, isotope effects, substituent effects, Hammett linear free energy relationship, Taft equation; Addition reaction to C=C and C=O; Preliminary idea of radical reactions; Application of Oxidation and Reduction reactions and reagents, Name reactions - Sharpless epoxidation, Suzuki coupling, Heck coupling. Mechanism of aromatic nucleophilic and electrophilic substitutions; Introduction to synthesis of nucleic acids and peptide chemistry.	
Books (In case UG compulsory courses, please give it as "Text books" and "Reference books". Otherwise give it as "References".	
Texts: (Format: Authors, <i>Book Title in Italics font</i> , Volume/Series, Edition Number, Publisher, Year.)	
1.	E. V. Anslyn and D. A. Dougherty, <i>Modern Physical Organic Chemistry</i> , 1st Ed., University Science Books, California, 2006.
2.	F. A. Carey and R. J. Sundberg, <i>Advanced Organic Chemistry: Structure and Mechanisms (Part A and B)</i> , Kluwer Academic/ Plenum Pub., 2000
References: (Format: Authors, <i>Book Title in Italics font</i> , Volume/Series, Edition Number, Publisher, Year.)	
1	P. Sykes, <i>A guide to mechanism in Organic Chemistry</i> , 6th Ed., Pearson Education, 2004.
2	M. B. Smith and J. March, <i>Advanced Organic Chemistry</i> , 6th Ed., John Wiley and Sons, Inc, 2007.
3	D. Nasipuri, <i>Stereochemistry of Organic Compounds</i> , Wiley, 1994.

<b>Course Number &amp; Title: CH1113 Chemical Technology Lab-I</b>	
<b>L-T-P-C:</b> 0-0-3-3	
Type of Letter Grading (Regular Letter Grades / PP or NP Letter Grades): Regular Letter Grades	
Kind of Proposal (New Course / Revision of Existing Course): New Course	
Offered as (Compulsory / Elective): Compulsory	
Offered to: BTech (CST)	
Offered in (Odd/ Even / Any): Odd	
Offered by (Name of Department/ Center): Chemistry	
<b>Pre-Requisite:</b> None	
<b>Preamble / Objectives (Optional):</b> The practical course is designed to teach different fundamental chemistry experimental techniques.	
<b>Course Content/ Syllabus:</b> Familiarization with Chemistry laboratory practice, safety, health, and environmental issues. Standardization of KMnO <sub>4</sub> by Oxalic acid. Reaction of 4-Aminotoluene and o-Vanillin - Preparation of Azomethine. Transesterification reaction - Synthesis of Biodiesel. Synthesis and characterization of tris(acetylacetonato)-manganese(III). Determination of the dissociation constant of a weak acid using pH meter. Conductometric titration of a strong acid with a strong base. Determination of the total hardness of water by complexometric titration. Preparation of a Detergent.	
Books (In case UG compulsory courses, please give it as "Text books" and "Reference books". Otherwise give it as "References".	
Texts: (Format: Authors, <i>Book Title in Italics font</i> , Volume/Series, Edition Number, Publisher, Year.)	
1.	V. K. Ahluwalia, S. Dhingra, A. Gulati, <i>College Practical Chemistry</i> . Universities Press (India) Pvt. Ltd. 2005.

<b>Course Number &amp; Title: CH1201-03H Basic Physical Chemistry</b>	
<b>L-T-P-C:</b> 3-0-0-3	
Type of Letter Grading (Regular Letter Grades / PP or NP Letter Grades): Regular Letter Grades	
Kind of Proposal (New Course / Revision of Existing Course): New Course	
Offered as (Compulsory / Elective): Compulsory	
Offered to: BTech (BT, CL, MC)	
Offered in (Odd/ Even / Any): Even	
Offered by (Name of Department/ Center): Chemistry	
<b>Pre-Requisite:</b> None	
<b>Preamble / Objectives (Optional):</b> The course is designed to teach fundamental physical chemistry.	
<b>Course Content/ Syllabus:</b>	

Quantum Chemistry: Origin of quantum theory, postulates of quantum mechanics, Schrodinger wave equation: operators and observables, superposition theorem and expectation values, solutions for a particle in a box, harmonic oscillator, rigid rotator, hydrogen atom. Basic thermodynamics, Kinetics, and Reaction Mechanisms: Energy profiles, transition state theory, and reaction coordinate diagrams.

Books (In case UG compulsory courses, please give it as "Text books" and "Reference books". Otherwise give it as "References".

Texts: (Format: Authors, *Book Title in Italics font*, Volume/Series, Edition Number, Publisher, Year.)

1.	P. Atkins and J. De Paula, "Physical Chemistry," 8th Edition, Oxford University Press, New York, 2006
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2.	Physical Chemistry, Ira N. Levine, 5 <sup>th</sup> Edition, McGraw-Hill, 2002
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References: (Format: Authors, *Book Title in Italics font*, Volume/Series, Edition Number, Publisher, Year.)

1	Quantum chemistry, Ira N. Levine, 5th ed., New Delhi, Prentice Hall, 2000.
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2	Molecular quantum mechanics, P.W. Atkins and R.S. Friedman., 3rd ed., Oxford University Press, 1997
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**Course Number & Title: CH1204-05H Basic Analytical Chemistry**

**L-T-P-C:** 3-0-0-3

Type of Letter Grading (Regular Letter Grades / PP or NP Letter Grades): Regular Letter Grades

Kind of Proposal (New Course / Revision of Existing Course): New Course

Offered as (Compulsory / Elective): Compulsory

Offered to: BTech (BT, CL)

Offered in (Odd/ Even / Any): Even

Offered by (Name of Department/ Center): Chemistry

**Pre-Requisite:** None

**Preamble / Objectives (Optional):** The course is designed to teach fundamental Analytical chemistry.

**Course Content/ Syllabus:**

Basic concepts of analytical chemistry. Principles of spectroscopic techniques (UV-Vis, IR); NMR techniques (1D, basic concept of 2D NMR); Mass Spectrometry for complex molecules; Applications in structure elucidations. Basic concepts of microscopic techniques (SEM, TEM, and AFM).

Books (In case UG compulsory courses, please give it as "Text books" and "Reference books". Otherwise give it as "References".

Texts: (Format: Authors, *Book Title in Italics font*, Volume/Series, Edition Number, Publisher, Year.)

1.	C. N. Banwell, and E. M. McCash, <i>Fundamentals of Molecular Spectroscopy</i> , 4 <sup>th</sup> Ed., Tata McGraw-Hill, 1994.
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2.	D. A. Skoog, D. M. West, F. J. Holler, S. R. Crouch, <i>Fundamentals of Analytical Chemistry</i> , 10 <sup>th</sup> Ed., Cengage, 2023.
References: (Format: Authors, <i>Book Title in Italics font</i> , Volume/Series, Edition Number, Publisher, Year.)	
1	D. Harvey, <i>Modern Analytical Chemistry</i> , McGraw-Hill, 2000.

<b>Course Number &amp; Title: CH1206 Introduction to Chemistry of Biomolecules</b>	
<b>L-T-P-C:</b> 3-0-0-6	
Type of Letter Grading (Regular Letter Grades / PP or NP Letter Grades): Regular Letter Grades	
Kind of Proposal (New Course / Revision of Existing Course): New Course	
Offered as (Compulsory / Elective): Compulsory	
Offered to: BTech (CST)	
Offered in (Odd/ Even / Any): Any	
Offered by (Name of Department/ Center): Chemistry	
<b>Pre-Requisite:</b> None	
<b>Preamble / Objectives (Optional):</b> The course is designed to provide basic idea about the biomolecules and their chemistry. The knowledge about the protein, DNA, Lipid and Carbohydrate structures and functioning is essential for further interdisciplinary courses like, drug design and medicinal chemistry.	
<b>Course Content/ Syllabus:</b> Evolution of life: Origin of Life, Darwin's concepts of evolution. Introduction to biomolecules. Weak interactions in biomolecules. Basics of protein structure and functioning: primary, secondary, tertiary, and quaternary structures of proteins, protein folding, protein denaturation. Protein functioning: enzyme kinetics, enzyme inhibition. Lipids and Membranes: Common classes of lipids, self-association of lipids, liposomes, biological membranes, and membrane transportation. Basics of nucleic acid structure and function: structures and functions of DNA and RNA. Structures and properties of biological small molecules: vitamins, coenzymes. Basics of carbohydrates: structure and function.	
Books (In case UG compulsory courses, please give it as “Text books” and “Reference books”. Otherwise give it as “References”).	
Texts: (Format: Authors, <i>Book Title in Italics font</i> , Volume/Series, Edition Number, Publisher, Year.)	
1.	J. L. Tymoczko, J. M. Berg and L. Stryer, Biochemistry, 8th Ed, W. H. Freeman & Co, 2015.
2.	D. L. Nelson and M. M. Cox, Lehninger Principles of Biochemistry, 7th Ed, Macmillan Worth, 2017.
References: (Format: Authors, <i>Book Title in Italics font</i> , Volume/Series, Edition Number, Publisher, Year.)	
1	N. Hopkins, J. W. Roberts, J. A. Steitz, J. Watson and A. M. Weiner, Molecular Biology of the Gene, 7th Ed, Benjamin Cummings, 1987.
2	C. R. Cantor and P. R. Schimmel, Biophysical Chemistry (Parts I, II and III), W.H. Freeman & Co., 1980.