ONLINE

Minutes of Meeting

BoS Meeting - 01 March 2021

Engineering Chemistry Syllabus for I Year B. Tech.

Chairman: Dr. Logudurai R., Associate Professor & Head - Chemistry, MITS.

The board of studies meeting for the Department of Chemistry was held virtually (Microsoft Teams) on 01st March 2021. Some of the committee members were not able to attend the meeting due to their schedule, however, the comments/suggestions were received via e-mail.

Syllabus for the following courses were discussed.

1. Engineering Chemistry (20CHE101)
2. Chemistry Laboratory (20CHE201).

Members Attended:

1. **Dr. V. Saravanan (Industry Expert)**
2. Dr. G. V. Subba Reddy (University Nominee)

Internal Members:

1. **Dr. Balaji R.**
2. **Dr. Arunbabu D.**
3. **Dr. Selvaganapathi A.**
4. **Dr. Venkateswarlu Ch.**
5. **Dr. Renjith B.**

20CHE101 **Engineering Chemistry**

L	T	P	C
3	0	0	3

The following suggestions were given by the BoS members for this foundation courses for the I Year B. Tech. students.

Unit I:

- The topic, "Dissolved Oxygen by Winkler's method" is added after the "Alkalinity and its importance".
- The topics "Boiler corrosion, Caustic embrittlement, Scale, Sludge formation" are added under the topic, "Disadvantages (industry level) of using hardwater". Though these topics have been taught, it was recommended to include in the syllabus.

Unit II:

- The topics are approved without any changes.

Unit III:

- The topics are approved without any changes.

Unit IV:

- The topic "free energy" which is coming after "Estimations of Entropy in Isothermal, Isobaric and Isochoric processes" is removed, since it has been discussed earlier in the same unit and it will be discussed again along with EMF.

Unit V:

- The topic, "Reactions in setting and hardening of Cement" is added after the topic "Cement Materials and Manufacturing Process". Though the topic has been taught, it was recommended to include in the syllabus.
- The topic, "Saponification number" is removed.
- The topics, "Sol-Gel and Hydrothermal" under the topic, "Chemical synthesis of Nanomaterials" are removed.
- The topic, "H_2 storage" under the topic "Applications of Nanomaterials" is removed. Similarly, the example "ZnO" under the topic, "Photocatalytic Dye Degradation" is removed.

Members Attended:

1. Dr. V. Saravanan (Industry Expert)
2. Dr. G. V. Subba Reddy (University Nominee)

Internal Members:

1. Dr. Balaji R.
2. Dr. Arunbabu D.
3. Dr. Selvaganapathi A.
4. Dr. Venkateswarlu Ch.
5. Dr. Renjith B.

ONLINE

20CHE201	Chemistry Laboratory	L	T	P	C
		0	0	3	1.5

The following suggestions were given by the BoS members for this foundation courses for the I Year B. Tech. students.

- The experiment (No. 3), "Adsorption of acetic acid on charcoal" is removed and instead of that, the experiment, "Estimation of dissolved oxygen by Winkler's method" is added.
- Remaining all other experiments are approved as suggested.

Members Attended:

1. Dr. V. Saravanan (Industry Expert)
2. Dr G. V. Subba Reddy (University Nominee)

Internal Members:

1. Dr. Balaji R.
2. Dr. Arunbabu D.
3. Dr. Selvaganapathi A.
4. Dr. Venkateswarlu Ch.
5. Dr. Renjith B.

Madanapalle Institute of Technology & Science

(UGC-Autonomous)

B. Tech I Year I/II Semester

20CHE101 ENGINEERING CHEMISTRY

L	T	P	C
3	0	0	3

Course Pre-requisite: Basic Chemistry at Intermediate or equivalent level.

Course Description: Deals with the basic principles of various branches of chemistry like physical, organic, inorganic, analytical and nanomaterial chemistry.

COURSE OBJECTIVES:

Students will

1. Understand, analyse and determine the impurities present in the water.
2. Appreciate the synthetic organic reactions used in daily life.
3. Learn the principles of spectroscopies to analyse them.
4. Value the basic concepts of thermodynamics and electrochemistry.
5. Be exposed to the importance of nano and engineering materials used in their daily life and industry.

UNIT I: Impurities Present in Water and Water Treatment **(9 hours)**

Impurities present in Water: Impurities in water (BIS and WHO standards), Hardness of water- determination of hardness - EDTA Method (numerical problems), Alkalinity of water (numerical problems), Estimation of Dissolved Oxygen by Winkler's method and its importance and Chlorides. Disadvantages (industry level) of using hard water (Boiler corrosion, Caustic embrittlement, Scale and Sludges). Softening of water (Ion exchange method), Treatment of brackish water by Reverse Osmosis method. Water treatment for civic applications: coagulation, sedimentation, filtration, sterilization - chlorination and ozonation. Concept of break point chlorination.

UNIT II: Periodic Properties and Organic Reactions **(7 hours)**

Periodic properties: Electronic configurations, atomic and ionic sizes, ionization energies, oxidation states, molecular geometries. Organic Reactions: Introduction to substitution (S_N^1 and S_N^2), elimination (E_1 and E_2) - Addition, Condensation and Free Radical Polymerization Reaction (only the mechanism).

UNIT III: Spectroscopy **(8 hours)**

Basic Principle and Applications of UV-Visible, FT-IR, Raman, Microwave and Nuclear Magnetic Resonance (NMR) Spectroscopy.

UNIT IV: Thermodynamics and Electrochemistry **(11 hours)**

Thermodynamics: Systems, State Functions, Thermodynamic Functions: Work, Energy, Entropy and Free energy. Estimations of Entropy in Isothermal, Isobaric and Isochoric processes. Electrochemistry: Free energy and EMF. Cell potentials, the Nernst equation and applications. Batteries (Lead-Acid and Lithium ion) and Fuel-Cells (H_2-O_2).

UNIT V: Engineering Materials, Nanoscience & Nanotechnology **(10 hours)**

Engineering Materials: Cement Materials and Manufacturing Process. Reactions in setting and hardening of Cement. Lubricants – definition, Properties of lubricants – Viscosity, Viscosity Index, Flash Point and Pour Point. Nanomaterials: Introduction, Classes/Types, Chemical synthesis of Nanomaterials: Chemical Vapor Deposition method (Carbon Nanotubes), Characterization by powder XRD (Scherrer's equation). Applications of Nanomaterials: Solar Energy and Photocatalytic Dye Degradation (TiO_2).

COURSE OUTCOMES:

At the end of the course, the students will be able to

1. Analyse and determine the impurities in water such as hardness, alkalinity for sustainable development.
2. Prepare organic compounds/polymers for environmental, safety and society need.
3. Comprehend the principles and applications of spectroscopies.
4. Apply the concept of free energy in thermodynamics, electrochemistry for solving the problems evolve in the engineering processes.
5. Acquire spotlight to the nanomaterials and basic engineering materials used in academics, industry, and daily life.

Textbooks:

1. **P. W. Atkins & Julio de Paula, 'The Elements of Physical Chemistry',** Ninth edition (Oxford University Press, Oxford 2010).
2. **C. N. Banwell, Fundamentals of Molecular Spectroscopy,** Fourth Edition, (Tata McGraw Hill, 2008).
3. **Ralph H. Petrucci, F. Geoffrey Herring, Jeffry D. Madura, Carey Bissonnette, General Chemistry - Principles and Modern Applications,** Tenth Edition, (Pearson, 2011).
4. **Dr. S. S. Dara and Dr. S. S. Umare, A Textbook of Engineering Chemistry,** 1st Edition., (S. Chand & Company Ltd, 2000).
5. **T. Pradeep, Nano: The Essentials,** 1st Edition, (Tata McGraw-Hill Publishing Company Limited, 2017).

Reference Books:

1. 'Physical Chemistry', D. W. Ball, First Edition, India Edition (Thomson, 2007).
2. Perry's Chemical Engineers' Handbook, Don W. Green and Marylee Z. Southard, 9th Edition (McGraw Hill, 2018).
3. Engineering Chemistry, Dr. Suba Ramesh and others, 1st Edition (Wiley India, 2011).
4. Jain and Jain, Engineering Chemistry,16th Edition (Dhanpat Rai Publishing Company (P) Ltd, 2016).
5. Amretashis Sengupta, Chandan Kumar Sarkar (eds.), Introduction to Nano Basics to Nanoscience and Nanotechnology (Springer-Verlag, Berlin, Heidelberg, 2015)

Mode of Evaluation: Assignment / Quiz, Classroom participation, Mini project / Report, Internal Mid Examination and external semester end examination.

MADANAPALLE INSTITUTE OF TECHNOLOGY AND SCIENCE

(UGC-Autonomous)

B.Tech I Year I/II Semester

20CHE201 **CHEMISTRY LABORATORY**

L	T	P	C
0	0	3	1.5

Course Prerequisites: Basic Chemistry at Intermediate or equivalent level.

Course Description: It deals with basic principles of volumetric and instrumental analytical methods.

Course Objective: This Engineering Chemistry Laboratory is common to all branches of I Year B Tech. At the end of the course the student is expected to Students will

1. Learn to estimate the chemical impurities present in water such as hardness, alkalinity, chlorine, etc.
2. Understand and experience the formation of inorganic complex and analytical technique for trace metal determination.
3. Be trained to use the instruments to practically understand the concepts of electrochemistry.
4. Bridge theoretical concepts and their practical engineering applications, thus highlighting the role of chemistry in engineering.

Lab Experiments (12 Experiments)

1. Estimation of total, permanent and temporary hardness of water by EDTA method.
2. Estimation of alkalinity of water sample.
3. Estimation of dissolved oxygen by Winkler's method.
4. Determination of molecular weight of a polymer by using Ostwald's viscometer.
5. Determination of rate constant of an ester hydrolysis (Pseudo First Order reaction).
6. Determination of strength of a Strong acid (conc. H_2SO_4) by conductometric titration (Neutralisation Titration).
7. Conductometric titration of $BaCl_2$ Vs Na_2SO_4 (Precipitation Titration).
8. Dissociation constant of weak electrolyte by Conductometry.

9. Determination of percentage of Iron in Cement sample by colorimetry.
10. Estimation of ferrous ion by Potentiometric titration (Redox Titration).
11. Saponification value of oil.
12. Formation of Iron-1,10-phenanthroline complex and determination of iron by colorimetry.

Course Outcome: After the completion of the Engineering Chemistry Laboratory experiments, students will be able to

1. Develop and perform analytical chemistry techniques to address the water related problems (for e.g., hardness, alkalinity present in water) technically.
2. Handle electro-analytical instruments like digital conductivity meter and potentiometer to perform neutralization, precipitation, and redox titrations, respectively.
3. Acquire practical skills to handle spectro-photochemical methods to verify Beer-Lambert's Law.
4. Operate various instruments for the analysis of materials and produce accurate results in a given time frame.
5. Think innovatively and improve the creative skills that are essential for solving engineering problems.

Textbook:

1. Engineering Chemistry Lab Manual (2017-18), Dept. of Chemistry, Madanapalle Institute of Technology and Science, Madanapalle – 517325, Chittoor Dist., Andhra Pradesh, India.
2. "Vogel's Textbook of Qualitative Chemical Analysis", Arthur Israel Vogel, Prentice Hall, 2000.
3. Laboratory Manual on Engineering Chemistry, by Dr Sudha Rani, Dhanpat Rai Publishing house, 2009.
4. A Textbook on Experiments and calculations in Engineering Chemistry, by SS Dara, S Chand publications, 2015.
5. Laboratory Manual of Organic Chemistry, by Raj K Bansal, Wiley Eastern Limited, New age international limited, 2009.

Mode of evaluation: Continuous evaluation of the lab experiments, record, viva-voce, and external lab examination.

Minutes of Meeting

BoS Meeting - 31 August 2021

Life Science for Engineers Syllabus for II Year B. Tech.

Chairman: Dr. Balaji Ramanujam, Associate Professor & Head - Chemistry, MITS.

The board of studies meeting for the Department of Chemistry was held virtually (Microsoft Teams) on 31st August 2021. Except few committee members, all the members attended the meeting, however, the comments/suggestions of those who were not available, were received via e-mail.

Syllabus for the following courses were discussed.

1. Life Science for Engineers (20BIO101).

Members Attended:

1. **Dr. Prabhakaran S (External Subject Expert)**
2. **Dr. Narayanamurthy S (External Industry Expert)**

Internal Members:

1. **Dr. Balaji R. (HoD and Chairman)**
2. **Dr. Arunbabu D.**
3. **Dr. Ashok Kumar Das**
4. **Dr Renjith B.**
5. **Dr Rahul Pal**

20BIO101	Life Science for Engineers	L T P C 2 0 0 2

The following suggestions were given by the BoS members for the above course for the II Year B. Tech. students.

Unit I:

- The removal of the topic "Biological observations of 18th Century that led to major discoveries", due to the course coverage and topic irrelevance was approved.

Unit II:

- As suggested by the panel members, the repeated word descriptors (structure, function, etc..) were removed, and further topics were fine tuned for coherence.

Unit III:

- As per the suggestion of the panel members, renaming of "respiration" to "cellular respiration", An additional topic on "Introduction to Cardiovascular system", and removal of synaptic junction were implemented.

Unit IV:

- As per the suggestions of the panel members, the title of the unit has been renamed to "Genetics" and further an additional topic on introduction of gene sequencing is introduced.

Unit V:

- Additional topic on the introduction to Lymphatic systems has been done, the phrase "this should include" is changed as "Energetics", and the phase "synthesis of glucose from CO_2+water" is removed.

Signature of the panel members

Members Attended:

1. **Dr. Prabhakaran S (External Subject Expert)** — **Virtually present**
2. **Dr. Narayanamurthy S (External Industry Expert)** — **Virtually Present**

Internal Members:

1. **Dr. Balaji R. (HoD and Chairman)**
2. **Dr. Arunbabu D.**
3. **Dr. Ashok Kumar Das**
4. **Dr Renjith B.**
5. **Dr Rahul Pal**

II B.Tech. I / II Sem

20BIO101 Life Sciences for Engineers

L	T	P	C
2	0	0	2

Course Prerequisites: Basic knowledge about sciences up to intermediate or equivalent level.
Course Description: The course deals with basic concepts of life sciences, its impact on human & universe, biological systems and functions, human physiology and metabolism.
Course Objectives

- Introduce the molecular basis of life.
- Provide the basis for classification of living organisms.
- Describe the transfer of genetic information.
- Introduce the techniques used for modification of living organisms.
- Describe the applications of biomaterials

Unit I: Introduction to Life Sciences & Living Organisms (8 hours)

Why we need to study Life Sciences? Comparison and differences of biological organisms with manmade systems (Eye & Camera, Bird flying & Aircraft), Classification of living organisms, Cellular basis of life, differences between prokaryotes and eukaryotes, classification on the basis of carbon and energy sources.

Unit II: Biomolecules & Macromolecules (10 hours)

Molecules of life: Water, Sugars, Starch, Cellulose, Amino acids, Structure and functions of proteins (primary, secondary, tertiary and quaternary structure), nucleotides, nucleic acids, DNA & RNA, hemoglobin, antibodies and enzymes, Industrial applications of enzymes and Fermentation process.

Unit III: Human Physiology (7 hours)

Bioenergetics, Cellular Respiration: Glycolysis and TCA cycle, Electron transport chain and oxidative phosphorylation, Human physiology: Introduction to Cardiovascular system, Neurons and Neuromuscular junctions.

Unit IV: Genetics (10 hours)

Mendel's laws, Mitosis and Meiosis, Introduction to gene sequencing, single gene disorders in humans, Genetic code, DNA replication, Transcription, Translation. Recombinant DNA Technology: recombinant vaccines, transgenic microbes, plants and animals, animal cloning, biosensors, biochips.

(10 hours)

Unit V: Metabolism

Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergo and exergonic reactions. Concept of K_{eq} and its relation to standard free energy, Introduction Lymphatic system, ATP as an energy currency. Energetics of breakdown of glucose into CO_2 + H (Glycolysis and Krebs cycle), Mechanism of Photosynthesis.

Course Outcomes

After studying the course, the student will be able to:

- **CO 1: explain** the differences between biological organisms and manmade systems classify organisms (L2)
- **CO 2: interpret** the relationship between the structure and function of proteins, nucleic and summarize the industrial applications of biomolecules (L2)
- **CO 3: explain** the mechanism of respiration
- **CO 4: demonstrate** the mapping of genes. (L2) and explain the medical importance of disorders. (L2)
- **CO 5: apply** thermodynamic and kinetic principles to biological systems (L2)

Text books:

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A g approach", Pearson Education Ltd, 2018.
2. Arthur T Johnson, Biology for Engineers, CRC press, 2011.
3. De Robertis E.D.P., Cell And Molecular Biology 8Ed, Lippincott, Williams & Wilkins press, 2017.
4. Nelson, D. L.; and Cox, M. M.W.H., Lehninger Principles of Biochemistry (V Edition Freeman and Company, 2008
5. G K Suraishkumar, Biology for Engineers, Oxford University Press; First edition (1 M 2019)

Reference Books:

1. Alberts Et. Al. The molecular biology of the cell, 6/e, Garland Science, 2014.
2. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry" Wiley and Sons, 2009.
3. John Enderle and Joseph Bronzino Introduction to Biomedical Engineering, 3/e, 2012