MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)
Affiliated to JNTUA, Anantapuramu& Approved by AICTE, New Delhi
Recognised Research Center, Accredited by NBA for CE, CSE, ECE, EEE, ME, MBA & MCA, Recognised by UGC under the sections 2(f) and 12(B) of the UGC act 1956

Department of Chemistry

Minutes of BoS Meeting conducted virtually on 31st October 2023

Chairman: Dr. Renjith Bhaskaran, Assistant Professor & Head, Department of Chemistry, MITS.

The Department of Chemistry's BoS meeting took place virtually on 31st October 2023. Certain committee members couldn't attend due to their busy schedules; however, they sent their comments and suggestions via email.

Agenda

To discuss the proposed I-B. Tech course syllabus, including both the theory and lab courses of the Chemistry and Engineering Chemistry curriculum, as outlined in the R-23 regulation by JNTUA.

External Members:

1. Dr. G. V. Subba Reddy, Professor - JNTUA Pulivendula Campus (University Nominee).
2. Dr. V. Saravanan, Director - Onium Life Sciences, Bengaluru (Industry Expert).

Internal Members:

1. Dr. K. Chandramohan, Associate Professor
2. Dr. P. Amaladass, Assistant Professor
3. Dr. Ashok Kumar Das, Assistant Professor
4. Dr. Rahul Pal, Assistant Professor
5. Dr. R. Rajaram, Assistant Professor
6. Dr. K. Imran, Assistant Professor

23CHE102 CHEMISTRY

(Common to EEE, ECE, CSE & allied branches)

L	T	P	C
3	0	0	3

The suggestions from BoS external member Dr. G. V. Subba Reddy have resulted in the incorporation of the following changes in the Chemistry theory course.

Course Objectives

The first course objective, "to familiarize engineering chemistry and its applications," has been revised to "**to familiarize chemistry and engineering applications**."

Likewise, the third course objective, "to introduce instrumental methods, molecular machines, and switches," has been modified as "**to introduce various instrumental techniques and their applications**."

Unit I

In the molecular orbital theory section, two more molecules are added, namely, one homodiatomic N_2 molecule and one heterodiatomic NO molecule.

Unit II

In the semiconductor section, the topic of "**the role of doping agents**" is included.

Unit III

The topic "**sodium-air battery**" is included as an example of primary cells following the Zinc-air battery.

Unit IV

"**The polydispersity index (PDI) and its significance**" have been incorporated into the introduction section of polymers.

Unit V

The term "IR spectroscopies" is changed to "**IR spectroscopy**."

Text Books

We have included an additional textbook titled "**Engineering Chemistry", McGraw-Hill; First Edition, 2019**.

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Department of Chemistry

B. Tech I Year I & II Semester

23CHE102 CHEMISTRY
(Common to EEE, ECE, CSE & allied branches)

L	T	P	C
3	0	0	3

Course Objectives:

- To familiarize chemistry and engineering applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce various instrumental techniques and their applications

UNIT I STRUCTURE AND BONDING MODELS **9 hours**

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2, particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of N_2, O_2 and NO, CO π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT II MODERN ENGINEERING MATERIALS **9 hours**

Semiconductors – Introduction, basic concept, role of doping agents, applications
Super conductors-Introduction, basic concept, applications.
Supercapacitors: Introduction, Basic Concept-Classification – Applications.

Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphene nanoparticles.

UNIT III ELECTROCHEMISTRY AND APPLICATIONS **9 hours**

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).
Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples. Primary cells – Zinc-air battery, Sodium-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT IV POLYMER CHEMISTRY **9 hours**

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation, Poly Dispersity Index (PDI) & it's significance
Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.
Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Poly Lactic Acid (PLA).

UNIT V INSTRUMENTAL METHODS AND APPLICATIONS **9 hours**

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopy, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications.

Course Outcomes:

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

CO1: Explain the foundations of Quantum mechanics and concept of bonding in homo and hetero diatomic molecules like N_2, O_2, NO, CO etc.

CO2: Apply the principle of Band diagrams in the application of conductors and semiconductors. Properties and applications of nanomaterials.

CO3: Compare the materials of construction for battery, its working principles, fuel cells & electrochemical sensors.

CO4: Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers.

CO5: Explain the principles of spectrometry, IR spectroscopy, technique of HPLC in separation of solid and liquid mixtures. Summarize the concepts of Instrumental methods.

Text Books:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e,Oxford University Press, 2010
3. G V Subba Reddy, K N Jayaveera, C Ramachandraiah, Engineering Chemistry, McGraw-Hill; First Edition, 2019.

Reference Books:

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

23CHE202 CHEMISTRY LABORATORY

(Common to EEE, ECE, CSE & allied branches)

L	T	P	C
0	0	2	1

The Chemistry Laboratory syllabus has been modified based on the suggestions from the BoS member, Dr. G. V. Subba Reddy.

The title of one of the experiments was modified from 'The Identification of simple organic compounds by IR' to '**Identification of functional groups in simple organic compounds by IR**.'

As per the present lab conditions (due to the lack of IR spectrophotometer and lack of chemicals), the department has decided to perform 10 experiments out of the listed 12 experiments.

B. Tech I Year I & II Semester

23CHE202 CHEMISTRY LABORATORY

(Common to EEE, ECE, CSE & allied branches)

L	T	P	C
0	0	2	1

Course Objectives:

- Verify the fundamental concepts with experiments.

List of Experiments:

1. Measurement of 10Dq by spectrophotometric method
2. Conductometric titration of strong acid vs. strong base
3. Conductometric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of functional groups in simple organic compounds by IR
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry

Course Outcomes:

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

CO1: Determine the cell constant and conductance of solutions.
CO2: Prepare advanced polymer Bakelite materials.
CO3: Measure the strength of an acid present in secondary batteries.
CO4: Measure the wavelength of absorption of some organic compounds using UV-Vis spectroscopy.
CO5: Determine the EMF & redox potentials using potentiometric titrations.

Reference Books:

1. Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

23CHE101 ENGINEERING CHEMISTRY

(Civil and ME branches)

L	T	P	C
3	0	0	3

The Engineering Chemistry theory syllabus has been revised based on the recommendations of BoS member Dr. G. V. Subba Reddy.

Unit I

The order of "**The specifications for drinking water as per BIS and WHO standards**" has been adjusted, and it is now included after the topic on electrodialysis.

Unit II

We have included the "**sodium-air battery**" as a primary cell example, following the Zinc-air battery.

Unit III

"**The polydispersity index (PDI) and its significance**" have been incorporated into the introduction section of polymers.

Unit IV

In the section on building materials, we have integrated the "**chemical reactions**" involved in the setting and hardening of cement.

Text Books

We have included an additional textbook titled "**Engineering Chemistry", McGraw-Hill; First Edition, 2019**.

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Department of Chemistry

B. Tech I Year I & II Semester

23CHE101 ENGINEERING CHEMISTRY

(Civil & ME branches)

L	T	P	C
3	0	0	3

Course Objectives:

- To familiarize engineering chemistry and its applications
- To impart the concept of soft and hard waters, softening methods of hard water
- To train the students on the principles and applications of electrochemistry, polymers, surface chemistry, and cement

UNIT I WATER TECHNOLOGY **9 hours**

Soft and hardwater, Estimation of hardness of water by EDTA Method, Estimation of dissolved Oxygen - Boiler troubles –Priming, foaming, scale and sludge, Caustic embrittlement, Industrial water treatment – Ion-exchange processes - desalination of brackish water, reverse osmosis (RO), electrodialysis and Specifications for drinking water as per BIS and WHO standards.

UNIT II ELECTROCHEMISTRY AND APPLICATIONS **9 hours**

Electrodes –electrochemical cell, Nernst equation, cell potential calculations.
Primary cells – Zinc-air battery, Sodium-air battery, Secondary cells – Nickel-Cadmium (NiCad),and lithium-ion batteries- working principle of the batteries including cell reactions; Fuel Cells-Basic Concepts, the principle and working of hydrogen-oxygen Fuel cell.
Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion, cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).

UNIT III POLYMERS AND FUEL CHEMISTRY **9 hours**

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth polymerization, Poly Dispersity Index (PDI) & it's significance.
Thermoplastics and Thermo-setting plastics-: Preparation, properties and applications of poly styrene. PVC, Nylon 6,6 and Bakelite.
Elastomers – Preparation, properties and applications of Buna S, Buna N, Thiokol rubbers.
Fuels – Types of fuels, calorific value of fuels, numerical problems based on calorific value; Analysis of coal (Proximate and Ultimate analysis), Liquid Fuels, refining of petroleum, Octane and Cetane number- alternative fuels- propane, methanol, ethanol and bio fuel-bio diesel.

UNIT IV MODERN ENGINEERING MATERIALS **9 hours**

Composites- Definition, Constituents, Classification- Particle, Fibre and Structural reinforced composites, properties and Engineering applications
Refractories- Classification, Properties, Factors affecting the refractory materials and Applications.

Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, saponification and Applications.
Building materials- Portland Cement, constituents, Setting and Hardening of cement with chemical reactions).

UNIT V SURFACE CHEMISTRY AND NANOMATERIALS **9 hours**

Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle formation, synthesis of colloids (Braggs Method), chemical and biological methods of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents,

Adsorption isotherm (Freundlich and Langmuir), BET equation (no derivation) applications of colloids and nanomaterials – catalysis, medicine, sensors, etc.

Course Outcomes:

At the end of the course, the students will be able to
CO1: Explain the estimation of impurities present in water like hardness and softening of impure water.
CO2: Explain the working principles of batteries & demonstrate the corrosion prevention methods and factors affecting corrosion
CO3: Explain the preparation, properties, and applications of thermoplastics, thermosetting, elastomers & conducting polymers & explain calorific values, octane number, refining of petroleum and cracking of oils.
CO4: Explain the setting and hardening of cement, properties of composites, lubricants & refractories.
CO5: Summarize the concepts of colloids, micelle and nanomaterials.

Text Books:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e,Oxford University Press, 2010.
3. G V Subba Reddy, K N Jayaveera, C Ramachandraiah, Engineering Chemistry, McGraw-Hill; First Edition, 2019.

Reference Books:

1. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
2. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman, 1992.
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

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Department of Chemistry

23CHE201 ENGINEERING CHEMISTRY LABORATORY

(for Civil and ME branches)

L	T	P	C
0	0	2	1

The Engineering Chemistry Laboratory syllabus has been modified based on the recommendations from the BoS member Dr. G. V. Subba Reddy.

We have added two more experiments to the syllabus:

1) **"Determination of Viscosity of a solution using Ostwald's Viscometer"** as 13th &
2) **"Determination of cell constant and conductance of solutions."** as 14th experiments.

However, given the present lab conditions, wherein the Redwood Viscometer and Junker's Gas Calorimeter are unavailable, the department has opted to conduct 10 experiments from the list of 14.

Signature of the members

1) **Dr. G. V. Subba Reddy – External Member:** Approved through email
2) **Dr. V. Saravanan – External Member:** Approved through email
3) **Dr. Renjith Bhaskaran – Chairman:**
4) **Dr. K. Chandramohan, Associate Professor**
5) **Dr. P. Amaladass, Assistant Professor**
6) **Dr. Ashok Kumar Das, Assistant Professor**
7) **Dr. Rahul Pal, Assistant Professor**
8) **Dr. R. Rajaram, Assistant Professor**
9) **Dr. K. Imran, Assistant Professor**

B. Tech I Year I & II Semester

23CHE201 ENGINEERING CHEMISTRY LABORATORY

(for Civil & ME branches)

L	T	P	C
0	0	2	1

Course Objectives:

- To verify the fundamental concepts with experiments

List of Experiments:

1. Determination of Hardness of a groundwater sample.
2. Estimation of Dissolved Oxygen by Winkler's method
3. Determination of Strength of an acid in Pb-Acid battery
4. Preparation of a polymer (Bakelite)
5. Determination of percentage of Iron in Cement sample by colorimetry
6. Estimation of Calcium in port land Cement
7. Preparation of nanomaterials by precipitation method.
8. Adsorption of acetic acid by charcoal
9. Determination of percentage Moisture content in a coal sample
10. Determination of Viscosity of lubricating oil by Redwood Viscometer 1
11. Determination of Viscosity of lubricating oil by Redwood Viscometer 2
12. Determination of Calorific value of gases by Junker's gas Calorimeter
13. Determination of Viscosity of a solution using Ostwald's Viscometer
14. Determination of cell constant and conductance of solutions

Course Outcomes:

At the end of the course, the students will be able to
CO1: Determine the cell constant and conductance of solutions.
CO2: Prepare advanced polymer materials.
CO3: Determine the physical properties like adsorption and viscosity.
CO4: Estimate the Iron and Calcium in cement.
CO5: Calculate the hardness of water.

Reference Books:

1. Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Re: Seeking Approval for the revised R23 Chemistry Syllabus

diqac jntua <diqac@jntua.ac.in>
Thu 02-Nov-23 3:55 PM
To:Chemistry Department <chemistryhod@mits.ac.in>
Cc:snjsankar <snjsankar@clri.res.in>;Saravanan V <v.saravanan@onium.in>

Dr. Renjith Bhaskaran,
Thank you for your mail. I approve the modified form of the syllabus of Chemistry and Engineering Chemistry theory and laboratory.

Thanks & Regards
Prof. G.V.SUBBA REDDY,
Director,
Internal Quality Assurance Cell (IQAC),
J.N.T. University Anantapur (JNTUA),
Ananthapuramu - 515 002
Andhra Pradesh, INDIA.
diqac@jntua.ac.in
+91 9154872664
www.jntua.ac.in

On Thu, Nov 2, 2023 at 12:53 PM Chemistry Department <chemistryhod@mits.ac.in> wrote:

Dear Sir,

On behalf of the Department of Chemistry at MITS and on my personal behalf, **I wanted to extend our heartfelt gratitude for your invaluable suggestions and contributions to enhancing the R23 Chemistry curriculum**. Your expertise and insights have been instrumental in shaping a more robust and comprehensive educational program.

We appreciate your kind willingness to dedicate your time and share your valuable feedback with us. Your dedication to the improvement of our curriculum has not gone unnoticed.

In light of your suggestions, we have made the necessary revisions to the syllabus and have documented the minutes of our meeting. We kindly request you to go through the Minutes of Meeting and the revised syllabus, which are attached to this email. **Your final approval is vital in moving forward with these changes.**

To streamline the approval process, we kindly ask you to confirm your approval via email. Your confirmation will help expedite the implementation of these improvements and ensure that our students receive the best possible education.

07-11-

Print Close

Re: Seeking Approval for the revised R23 Chemistry Syllabus

Saravanan V <v.saravanan@onium.in>
Thu 02-Nov-23 1:00 PM

To: Chemistry Department <chemistryhod@mits.ac.in>
Cc: diqac@jntua.ac.in <diqac@jntua.ac.in>; snjsankar <snjsankar@clri.res.in>

Dear Dr. Renjith,
I approve the updated R23 chemistry syllabus
Regards, Saravanan

Sent from my iPhone

> On 02-Nov-2023, at 12:53 PM, Chemistry Department <chemistryhod@mits.ac.in> wrote:
>
> Dear Sir,
>
> On behalf of the Department of Chemistry at MITS and on my personal behalf, **I wanted to extend our heartfelt gratitude for your invaluable suggestions and contributions to enhancing the R23 Chemistry curriculum.** Your expertise and insights have been instrumental in shaping a more robust and comprehensive educational program.
>
> We appreciate your kind willingness to dedicate your time and share your valuable feedback with us. Your dedication to the improvement of our curriculum has not gone unnoticed.
>
> In light of your suggestions, we have made the necessary revisions to the syllabus and have documented the minutes of our meeting. We kindly request you to go through the Minutes of Meeting and the revised syllabus, which are attached to this email. **Your final approval is vital in moving forward with these changes.**

07-11-2023 15

Re: Seeking Approval for the revised R23 Chemistry Syllabus

snjsankar <snjsankar@clri.res.in>
Thu 02-Nov-23 2:33 PM
To:Chemistry Department <chemistryhod@mits.ac.in>
Cc:diqac@jntua.ac.in <diqac@jntua.ac.in>;v saravanan <v.saravanan@onium.in>

The Chairman
Dr. Renjith Bhaskaran,
Assistant Professor & Head,
Department of Chemistry, MITS.

Dear Chairman,

I approve the Minutes of Meeting, BoS and R23 Chemistry revised syllabus.

Regards,
Dr S N Jaisankar

From: chemistryhod@mits.ac.in
To: diqac@jntua.ac.in, "snjsankar" <snjsankar@clri.res.in>, "v saravanan" <v.saravanan@onium.in>
Sent: Thursday, November 2, 2023 12:53:17 PM
Subject: Seeking Approval for the revised R23 Chemistry Syllabus

Dear Sir,

On behalf of the Department of Chemistry at MITS and on my personal behalf, **I wanted to extend our heartfelt gratitude for your invaluable suggestions and contributions to enhancing the R23 Chemistry curriculum**. Your expertise and insights have been instrumental in shaping a more robust and comprehensive educational program.

We appreciate your kind willingness to dedicate your time and share your valuable feedback with us. Your dedication to the improvement of our curriculum has not gone unnoticed.

In light of your suggestions, we have made the necessary revisions to the syllabus and have documented the minutes of our meeting. We kindly request you to go through the Minutes of Meeting and the revised syllabus, which are attached to this email. **Your final approval is vital in moving forward with these changes.**

To streamline the approval process, we kindly ask you to confirm your approval via email. Your confirmation will help expedite the implementation of these improvements and ensure that our students receive the best possible education.

07-11-