R-23

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

Minutes of the Meeting

BoS Meeting- 24th July 2024

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

The board of studies meeting for the Department of Chemistry was held virtually on 24th July 2024. All the external committee members were present in the meeting.

Agenda

Discussion on the syllabus for the following courses under R23 curriculum.

1) **Environmental Science (Mandatory course for second year students)**
2) **Introduction to Nano Science and Technology, (open elective course) &**
3) **Green Chemistry, and Catalysis for Sustainable Environment (open elective course).**

External Members:

1. Professor. G. V. Subbareddy, Director IQAC, JNTU Anantapur.
2. Dr. S. N. Jaisankar, Chief Scientist and Head, Professor AcSIR, CSIR-CLRI.
3. Dr. V. Saravanan, Director of Onium Life Sciences, Bengaluru.

Internal Members:

1. Dr. Raju V, Assistant Professor
2. Dr. P. Amaladass, Assistant Professor
3. Dr. Rajaram. R, Assistant Professor
4. Dr. K. Imran, Assistant Professor
5. Dr. Lipeeka Rout, Assistant Professor
6. Dr. Rashmi Roy, Assistant Professor
7. Dr. Ragavendran K, Assistant Professor
8. Dr. Sreenivasan R, Assistant Professor
9. Dr. Balaji Mohan, Assistant Professor
10. Dr. C. V. Raju, Assistant Professor

DEPARTMENT OF CHEMISTRY

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(An UGC-Autonomous Institution)

B.Tech. – Audit Course (Mandatory for all)
Total Hours: 30

L	T	P	C
2	0	0	0

23CHE901-ENVIRONMENTAL SCIENCE

The following changes are made to this **Environmental Science** syllabus based on the suggestions from BoS members.

- The program's course code is **23CHE901,** and it includes a total of **30 lecture hours**.
- Incorporated the outcomes of the specified course.

1. **Exploring different types of renewable and non-renewable energy sources.**
2. **Students will learn about the structure and function of different ecosystems.**
3. **Students will learn about different types of pollution (air, water, soil) and their sources, effects, and control measures.**
4. **Exploring the science behind climate change, its evidence, and its impacts on ecosystems and human societies.**
5. **Understanding demographic factors and their environmental implications.**

Unit I

- In the natural resources section, members recommended to include the term "**energy resources.**"

Unit II

- In the section on aquatic ecosystems, members suggested to add the term "**freshwater**" before ponds and the term "**marine ecosystem**" before oceans.
- Corrected the term Hot-sports to "**Hot-spots.**"
- In the Biodiversity and its Conservation section, members suggested to include the term "**specific case studies.**"

Unit III

- Members suggested to consolidate all pollution types, including water, air, and soil pollution, into a single sentence.

- The terms "**pollution case studies**" and "**the role of an individual in the prevention of pollution**" are addressed in a separate section.

Unit IV

- The term "**Sustainable Development Goals**" needs to be introduced in the first section.

Unit V

- Members suggested to include the term **"Polluted site"** in the fieldwork section.
- Based on the fieldwork, it was recommended that students visit various local polluted areas and industries in batches. Additionally, they are required to submit a report reflecting their observations from these visits.

Text Books

- Each textbook listed in the course syllabus includes its **publication year and edition number.**
  1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press, **Third Edition, 2021.**
  2. Palaniswamy, "Environmental Studies", Pearson Education, **Second Edition, 2014.**
  3. S. Azeem Unnisa, "Environmental Studies" Academic Publishing Company
  4. K. Raghavan Nambiar, "Textbook of Environmental Studies for Undergraduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd. **Second Edition, 2008.**

- An additional textbook by **A. Koushik & C. P. Koushik** is added which is entitled **"Perspectives in Environmental Studies" 'New Age International, 4th edition, 2006.**

References

- Includes the **publication year and edition number** of each reference listed in the course syllabus
  1. Deeksha Dave and E. Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications, **Second Edition, 2012.**
  2. M. Anji Reddy, "Textbook of Environmental Sciences and Technology", BS Publication, **Second Edition, 2023.**
  3. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, **Third Edition, 2009.**
  4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering." Prentice Hall of India Private Limited, **Second Edition, 2004.**
  5. G.R. Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House, **Fourth Edition, 2014.**

6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice Hall of India Private Limited, **Third Edition, 2007.**

Recent Publications

- Incorporated **recent research publications** relevant to the provided syllabus

1. Atika Qazi; Fayaz Hussain; Nasrudin ABD. Rahim; Glenn Hardaker; Daniyal Alghazzaw, "Towards sustainable energy: a systematic review of renewable energy sources, technologies, and public opinions," 10.1109/ACCESS.2019.2906402, IEEE Access, vol. 7, pp. 63837-63851, 2019.
2. Gina Garland, Samiran Banerjee, Anna Edlinger, Emily Miranda Oliveira, Chantal Herzog, Raphaël Wittwer, Laurent Philippot, Fernando T. Maestre, Marcel G. A. van der Heijden, "A closer look at the functions behind ecosystem multifunctionality: A review," https://doi.org/10.1111/1365-2745.13511, Journal of Ecology, vol. 109, no. 2, pp. 600-613, 2021.
3. Siddiqua, A, Hahladakis, J.N, and Al-Attiya, "An overview of the environmental pollution and health effects associated with waste landfilling and open dumping," https://doi.org/10.1007/s11356-022-21578-z, Environmental Science and Pollution Research, 29(39), pp.58514-58536, 2022.
4. Seddon N, Chausson A, Berry P, Girardin C.A, Smith A, and Turner B, "Understanding the value and limits of nature-based solutions to climate change and other global challenges," https://doi.org/10.1098/rstb.2019.0120, Philosophical Transactions of the Royal Society B, 375(1794), p.20190120, 2020.
5. Hannes Weber and Jennifer Dabbs Sciubba, "The effect of population growth on the environment: evidence from European regions," https://doi.org/10.1007/s10680-018-9486-0, European Journal of Population, vol. 35, pp. 379-402, 2019.

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B.Tech. – Audit Course (Mandatory for all)

Course Code: 23CHE901 **Total Lecture hours : 30**

ENVIRONMENTAL SCIENCE

L	T	P	C
2	0	0	0

Course Objectives:

- To make the students to get awareness of the environment.
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life
- To save the earth from the inventions by the engineers.

Course Outcomes:

- CO1: Exploring different types of renewable and non-renewable energy sources.
- CO2: Students will learn about the structure and function of different ecosystems.
- CO3: Students will learn about different types of pollution (air, water, soil) and their sources, effects, and control measures.
- CO4: Exploring the science behind climate change, its evidence, and its impacts on ecosystems and human societies.
- CO5: Understanding demographic factors and their environmental implications.

UNIT I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES (6h)

Definition, Scope, and Importance – Need for Public Awareness.

Natural Resources: Energy resources- Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

UNIT II: ECOSYSTEMS (7h)

Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a) Forest ecosystem.
b) Grassland ecosystem
c) Desert ecosystem.
d) Aquatic ecosystems (freshwater - ponds, streams, lakes, rivers, marine ecosystem- oceans, estuaries)

Biodiversity and its Conservation : Introduction, Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Specific case studies.

UNIT III: ENVIRONMENTAL POLLUTION (6h)

Definition, Cause, effects, and control measures of:
Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards
Pollution case studies - Role of an individual in the prevention of pollution

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes

Disaster management: floods, earthquakes, cyclones and landslides.

UNIT IV: SOCIAL ISSUES AND THE ENVIRONMENT (5h)

Sustainable Development Goals, From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rainwater harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents, and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products.

Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and Control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT V: HUMAN POPULATION AND THE ENVIRONMENT **(6h)**

Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of Information Technology in Environment and human health – Case studies.

Field Work: Visit a local area to document environmental assets River/forest grassland/hill/mountain – Polluted site - Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes.

Textbooks:

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press, Third Edition, 2021.
2. Palaniswamy, "Environmental Studies", Pearson Education, Second Edition, 2014.
3. S. Azeem Unnisa, "Environmental Studies" Academic Publishing Company
4. K. Raghavan Nambiar, "Textbook of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd. Second Edition, 2008.
5. A. Koushik & C. P. Koushik, Perspectives in Environmental Studies, New Age International, Fourth Edition, 2006.

References:

1. Deeksha Dave and E. Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications, Second Edition, 2012.
2. M. Anji Reddy, "Textbook of Environmental Sciences and Technology", BS Publication, Second Edition, 2023.
3. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, Third Edition, 2009.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice Hall of India Private Limited, Second Edition, 2004.
5. G.R. Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House, Fourth Edition, 2014.

6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice Hall of India Private Limited, Third Edition, 2007.

Recent Publications:

1. Atika Qazi; Fayaz Hussain; Nasrudin ABD. Rahim; Glenn Hardaker; Daniyal Alghazzaw, "Towards sustainable energy: a systematic review of renewable energy sources, technologies, and public opinions," 10.1109/ACCESS.2019.2906402, IEEE Access, vol. 7, pp. 63837-63851, 2019.

2. Gina Garland, Samiran Banerjee, Anna Edlinger, Emily Miranda Oliveira, Chantal Herzog, Raphaël Wittwer, Laurent Philippot, Fernando T. Maestre, Marcel G. A. van der Heijden, "A closer look at the functions behind ecosystem multifunctionality: A review," https://doi.org/10.1111/1365-2745.13511, Journal of Ecology, vol. 109, no. 2, pp. 600-613, 2021.

3. Siddiqua, A, Hahladakis, J.N. and Al-Attiya, "An overview of the environmental pollution and health effects associated with waste landfilling and open dumping," https://doi.org/10.1007/s11356-022-21578-z, Environmental Science and Pollution Research, 29(39), pp.58514-58536, 2022.

4. Seddon N, Chausson A, Berry P, Girardin C.A, Smith A. and Turner B, "Understanding the value and limits of nature-based solutions to climate change and other global challenges," https://doi.org/10.1098/rstb.2019.0120, Philosophical Transactions of the Royal Society B, 375(1794), p.20190120, 2020.

5. Hannes Weber and Jennifer Dabbs Sciubba, "The effect of population growth on the environment: evidence from European regions," https://doi.org/10.1007/s10680-018-9486-0, European Journal of Population, vol. 35, pp. 379-402, 2019.

Mode of Evaluation: Assignments, Mid Exams, Seminar

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B.Tech. – Open Elective

L	T	P	C
3	0	0	3

Total hours: 45

23CHE401 - Introduction to Nano Science and Technology

The following changes are made to this **Introduction to Nano Science and Technology** syllabus by the suggestions from BoS members.

- Changed the course title from 'Introduction to Nano Science and Technology' to **"Nanoscience and Technology."**
- The final section of the course description mentioned the term **"nanoscience"** with nanotechnology.
- Modified the first objective of the course **"To understand the emergence of nanoscience and nanotechnology through history."**

Unit I

- No modifications

Unit II

- Reorganize the terms related to physical and chemical methods in the nanomaterial synthesis section.

Unit III

- Expanded the acronym CNTs to **Carbon Nano Tubes** and members suggested to include the term **"allotropes of carbonaceous materials."**

Unit IV

- Included the part **"Basic principles, instrumentation, and applications– powder X-ray diffraction (XRD), and X-ray Photoelectron Spectroscopy (XPS)"** in the first part.
- Removed the terms crystal structure and composition from the first part.
- Members suggested to provide a suitable example of magnetic characterization in the last part: **Superconducting Quantum Interference Device (SQUID).**

Jnit V

- No modifications

Text Books:

- Included the most recent edition of the referenced textbooks, with only one textbook among the provided options having the latest edition.

1. Kenneth J. Klabunde (Eds), Nanoscale Materials Science, John Wiley & Sons, InC, **Second Edition, 2009.**

References:

- Added four recent references

1. C. Binns, Introduction to nanoscience and nanotechnology. John Wiley & Sons, 2021.
2. D. Andrews, T. Nann, and R. H. Lipson, Comprehensive nanoscience, and nanotechnology. Academic Press, 2019.
3. R. Prasad and T. Karchiyappan, Advanced research in nanosciences for water technology. Springer, 2019.
4. M. Sharon, History of nanotechnology: from prehistoric to modern times. John Wiley & Sons, 2019.

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B.Tech. – Open Elective

Total hours: 45

L	T	P	C
3	0	0	3

Course code: 23CHE401 - Nanoscience and Nanotechnology

Course Description

This is primarily a lecture course that brings together relevant knowledge from the disciplines of physics and chemistry to give students a fundamental understanding of the integrated multidisciplinary nature of Nanoscience and Nanotechnology.

Objectives

- To understand the emergence of nanoscience and nanotechnology through history.
- The various process techniques available for nanostructured materials.
- The role of nanotechnology in electronics and how basic nano-systems work
- To use physical reasoning to develop simple nanoscale models to interpret the behaviour of such physical systems

Unit 1: Molecule to Materials: Basics of Nanotechnology **(8 hours)**

Atomic Structures: Rutherford and Bohr's model of atom. Bohr's model to Quantum: Wave function, Uncertainty principle, Orbital quantum numbers, Shape of the orbitals. Types of simple crystal structures, Defects in nanocrystals. History & emergence (Feynman to present) of Nanoscience and Nanotechnology, Challenges in Nanotechnology.

Unit 2: Types and Synthesis of Nanostructures **(10 hours)**

Definition of a Nanosystem - Zero Dimensional (0D), One Dimensional (1D) - Two Dimensional (2D) - Three Dimensional (3D) nanostructured materials. Top-down and Bottom-up approaches, Nanoscale building blocks. Synthesis of nanomaterials – Physical: Atomic Layer Deposition (ALD), & Chemical methods: Chemical Vapour Deposition (CVD), Chemical reduction, Electrochemical, Co-precipitation, Emulsion synthesis, Template based synthesis, Sol-Gel, Hydrothermal, Role of plants in nanoparticle (NP) synthesis.

Unit 3: Properties of Nanomaterials **(8 hours)**

Thermal, Mechanical, Optical, Electrical and Magnetic properties of nanomaterials (Metal oxides, Ceramics, Composites, Semiconductors) Carbon age materials: Carbon Nanotubes (CNTs), and allotropes of Carbonaceous materials. Relationship between surface effects on the properties of nanomaterials.

Unit 4: Characterization of Nanomaterials **(10 hours)**

Basic principles, instrumentation and applications of – powder X-Ray Diffraction (XRD); X-ray Photoelectron Spectroscopy (XPS); Optical & Electron microscopes: Scanning probe microscope, Scanning tunneling microscopes, Atomic force microscopes (AFM), Scanning electron microscope (SEM), Transmission electron microscope (TEM); Magnetic characterization: Superconducting Quantum Interference Device (SQUID).

Unit 5: Applications of Nanomaterials **(9 hours)**

Molecular electronics and nano-electronics – Quantum electronic devices – CNT based transistor and Field Emission Display (FED) - Biological applications - Biochemical sensor - Membrane based water purification, Target based drug delivery system, Light-Emitting Diode (LED) applications.

Course Outcomes:

Upon completion of this course the students will be able to:

1. Understand the correlation between atomic, molecular structures and nanomaterials
2. Classify the types and synthesis the nanomaterials based on the needs of the society and environment.
3. Infer and interpret the properties of nanomaterials
4. Apply the knowledge of characterization tools towards making the sustainable engineering products.
5. Illustrate the application of various nanomaterials in daily life, industry towards the sustainable development.

Text Books:

1. M. Wilson, K. Kannangara, G. Smith, M. Simmons, and B. Raguse, *Nanotechnology: Basic science and Emerging technologies*, Overseas Press India Pvt Ltd, New Delhi, First Edition, 2005.

2. C. N. R. Rao, A. Muller, and A. K. Cheetham (Eds), *The chemistry of nanomaterials: Synthesis, properties and applications*, Wiley VCH Verlag Gmbh & Co, Weinheim, 2004.

3. Kenneth J. Klabunde (Eds), *Nanoscale Materials Science*, John Wiley & Sons, InC, Second Edition, 2009.

4. C. S. S. R. Kumar, J. Hormes, and C. Leuschner, *Nanofabrication towards biomedical applications,* Wiley - VCH Verlag GmbH & Co, Weinheim, First Edition, 2004.

5. T.Pradeep, Nano: *The Essentials, Understanding Nanoscience and Nanotechnology*, Tata McGraw-Hill Publishing Company Limited, New Delhi, First edition, 2007.

References:

1. W. Rainer, *Nano Electronics and information Technology*, Wiley, 2003.

2. K. E. Drexler, *Nano systems*, Wiley, 1992.

3. G. Cao, *Nanostructures and Nanomaterials: Synthesis, properties and applications*, Imperial College Press, 2004.

4. C. Binns, Introduction to nanoscience and nanotechnology. John Wiley & Sons, 2021.

5.D. Andrews, T. Nann, and R. H. Lipson, Comprehensive nanoscience and nanotechnology. Academic press, 2019.

6. R. Prasad and T. Karchiyappan, Advanced research in nanoscience for water technology. Springer, 2019.

7. M. Sharon, History of nanotechnology: from prehistoric to modern times. John Wiley & Sons, 2019.

Mode of Evaluation: Assignments, seminar and written examination.

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B.Tech. – Open Elective
Total Hours: 45

L	T	P	C
3	0	0	3

23CHE501-Green Chemistry and Catalysis for Sustainable Environment

The following changes are made to this **Green Chemistry and Catalysis for Sustainable Environment** syllabus by the suggestions from BoS members.

- At the beginning of the course objectives, an additional phrase is introduced "**the student is able to.**"
- The last course objective has been modified to "**Learn to adopt green chemistry principles in practice.**"
-

Unit I

- Members suggested to remove the terms Wittig reactions, un-economic reactions, and design for degradation from the first part.
- Incorporate **"Click reactions"** in the first part.
- Replaced the term Waste Problems and Prevention with the new term "**Waste Reduction and Safe Disposal.**"

Unit II

- Include the term "**Enzyme catalysis"** in the last section. tery.

Unit III

- No modifications

Unit IV

- Revise the phrase "Advantages of Challenges" to "**Advantages and Challenges**" to correct the grammatical error.

Unit V

- Removed the sentence **"Other methods for Green synthesis of metal and metal oxide nanoparticles"** from the section.

Text Books

- Updated the edition number and publication year of the given textbooks.
  1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, **Third Edition, 2016.**
  2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, Oxford University Press, USA, **Fourth Edition, 2000.**

References:

- Included three more references in the reference section
  1. Green Chemistry: Theory and Practice by Paul T. Anastas and John C. Warner, First Edition, 2000.
  2. Green Chemistry: An Introductory Text by Mike Lancaster, First Edition, 2010.
  3. Introduction to Green Chemistry by Albert Matlack, Second Edition, 2010.

Signature of Members

Chairman:

1) Dr. Renjith Bhaskaran, Assistant Professor and Head

External Members:

1) Professor. G. V. Subbareddy, Director IQAC, JNTU Anantapur. Approved through email
2) Dr. S. N. Jaisankar, Chief Scientist and Head, Professor, CSIR-CLRI. Approved through email
3) Dr. V. Saravanan, Director of Onium Life Sciences, Bengaluru. Approved through email

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B.Tech. – Open Elective

23CHE501 Green Chemistry and Catalysis for Sustainable Environment

L	T	P	C
3	0	0	3

Course Prerequisite: Basic Engineering Chemistry or equivalent level

Course Description:
This course aims to introduce the interdisciplinary concept for engineering's to enhance their knowledge that they need to contribute with relevance and confidence in developing green technologies.
This course covers feedstocks, green metrics and the design of safer, more efficient processes, as well as the role catalysts and solvents and green processes for Nanoscience.

Course Objectives:

The student is able to

1. Learn an interdisciplinary approach to the scientific and societal issues arising from industrial chemical production, including the facets of chemistry and environmental health sciences that can be integrated to promote green chemistry
2. Sensitize the students in redesigning of chemicals, industrial processes and products by means of catalysis.
3. Understand the use of alternatives assessments in using environmentally benign solvents.
4. Emphasize current emerging greener technologies and the need of alternative energies.
5. Learn to adopt green chemistry principles in practice.

UNIT 1: PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY (9 h)

Introduction, Green chemistry Principles, sustainable development and green chemistry, atom economy, atom economic: Rearrangement, addition, Substitution, elimination and "click" reactions, Reducing Toxicity. Waste reduction and safe disposal.

UNIT 2: CATALYSIS AND GREEN CHEMISTRY (9h)

Introduction to catalysis, Heterogeneous catalysts: Basics of Heterogeneous Catalysis, Zeolites: Catalytic cracking, ZSM-5 catalyst and high silica zeolites, TS1 Oxidation catalyst, Catalytic Converters, Homogeneous catalysis: Hydrogenation of alkenes using wilkinson's catalyst, Phase transfer catalysis: Hazard Reduction, C–C Bond Formation, Oxidation Using Hydrogen Peroxide. Enzyme catalysis

UNIT 3: ORGANIC SOLVENTS: ENVIRONMENTALLY BENIGN SOLUTIONS (9h)

Organic solvents and volatile organic compounds, solvent free systems, supercritical fluids: Super critical carbon dioxide, super critical water and water as a reaction solvent: water-based coatings, Ionic liquids as catalyst and solvent.

UNIT 4: EMERGING GREENER TECHNOLOGIES AND ALTERNATIVE ENERGY SOURCES (9h)

Biomass as renewable resource, Energy: Fossil Fuels, Energy from Biomass, Solar Power, Fuel Cells (Hydrogen—oxygen fuel cell), Photochemical Reactions: Advantages and Challenges Faced by Photochemical Processes, Examples of Photochemical Reactions (caprolactam), Chemistry Using Microwaves: Microwave Heating, Microwave-assisted Reactions, Sonochemistry.

UNIT 5: GREEN PROCESSES FOR GREEN NANOSCIENCE (9h)

Introduction and traditional methods in the nanomaterials synthesis, Translating green chemistry principles for practicing Green Nanoscience. Green Synthesis of Nanophase Inorganic Materials and Metal Oxide Nanoparticles: Hydrothermal Synthesis, Reflux Synthesis, Microwave-Assisted Synthesis, Green chemistry applications of Inorganic nanomaterials.

Course Outcomes:

Upon completion of this course the students should

1. Recognize green chemistry concepts and apply these ideas to develop respect for the interconnectedness of our world and an ethic of environmental care and sustainability.
2. Understand and apply catalysis for developing eco-friendly processes.
3. Be in a position to use environmental benign solvents where ever possible.
4. Have knowledge of current trends in alternative energy sources.
5. Apply green chemistry principles in practicing green Nanoscience.

Text Books:

1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, Third Edition, 2016.
2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, Oxford University Press, USA, Fourth Edition, 2000.

References:

1. Edited by Alvise Perosa and Maurizio Selva , Hand Book of Green chemistry Volume 8: Green Nanoscience, wiley-VCH, 2012.
2. Green Chemistry: Theory and Practice by Paul T. Anastas and John C. Warner, First Edition, 2000.
3. Green Chemistry: An Introductory Text by Mike Lancaster, First Edition, 2010.
4. Introduction to Green Chemistry by Albert Matlack, Second Edition, 2010.

Mode of evaluation: Assignment, seminar, and written examination.

Internal Members:

1) Dr. Srinivasan R., Assistant Professor
2) Dr. P. Amaladass, Assistant Professor
3) Dr. Ragavendran K., Assistant Professor
4) Dr. Balaji Mohan, Assistant Professor
5) Dr. Rashmi Roy, Assistant Professor
6) Dr. Raju V., Assistant Professor
7) Dr. Lipeeka Rout, Assistant Professor
8) Dr. Rajaram R., Assistant Professor
9) Dr. K. Imran, Assistant Professor
10) Dr. C. V. Raju, Assistant Professor
11) Dr. Boobalan R., Assistant Professor

Re: Updated syllabuses and MoM for the BoS meeting

Saravanan V <v.saravanan@onium.in>
Sat 03-Aug-24 10:20 AM
To:HoD-Chemistry Department <chemistryhod@mits.ac.in>
Cc:diqac@jntua.ac.in <diqac@jntua.ac.in>;snjsankar <snjsankar@clri.res.in>

Dear All,

The modified syllabus looks good. From my side, I have no correction and approve the modified syllabus as it is for
23CHE901
23CHE501
23CHE401

Regards,
Saravanan

Sent from my iPhone

On 30 Jul 2024, at 11:56 AM, HoD-Chemistry Department <chemistryhod@mits.ac.in> wrote:

Respected BoS Members,

I kindly request you to find attached the minutes of the meeting conducted during the recent virtual BoS meeting held on the 24th of this month. Additionally, please find attached the updated syllabuses for your reference.

I request you to review the contents and send us your approval via email.

For your information, the honorarium details have been submitted to the accounts section and will be processed within one week. Thank you all once again for your invaluable support.

Best regards,

Dr. Renjith Bhaskaran,
Assistant Professor & Head
Department of Chemistry,
Madanapalle Institute of Technology & Science,
Madanapalle, Andhra Pradesh – 517325.
Mobile: +91 9160020737
https://mits.ac.in/facultyprofile/377
लोकाः समस्ताः सुखिनो भवन्तु॥
<Minutes of the Meeting_BoS.docx>
<R23 EVS_Syllubus-Modified.doc>
<INST_ OE_R23-Modified.doc>
<Green chem OE R23-Modified.docx>

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sankar <snjsankar@clri.res.in>
d 31-Jul-24 9:57 AM
HoD-Chemistry Department <chemistryhod@mits.ac.in>

ar Prof R Bhaskaran,
eetings.
ave received and downloaded all the attached files. All the corrections you have carried out the syllabus perfectly. Some of the open elective subjects: Please mention the country name e a pub in London) and a total hour was not mentioned (**23CHE501**). **I approve that MoM d all the syllabi including open electives are in the order.**
ood luck.
gards
Jaisankar

---

om: chemistryhod@mits.ac.in
: diqac@jntua.ac.in, "snjsankar" <snjsankar@clri.res.in>, "v saravanan" .saravanan@onium.in>
ent: Tuesday, July 30, 2024 11:56:51 AM
bject: Updated syllabuses and MoM for the BoS meeting

spected BoS Members,

indly request you to find attached the minutes of the meeting conducted during the recent tual BoS meeting held on the 24th of this month. Additionally, please find attached the dated syllabuses for your reference.

equest you to review the contents and send us your approval via email.

r your information, the honorarium details have been submitted to the accounts section and ill be processed within one week. Thank you all once again for your invaluable support.

est regards,

. Renjith Bhaskaran,
ssistant Professor & Head
epartment of Chemistry,
adanapalle Institute of Technology & Science,
adanapalle, Andhra Pradesh – 517325.
obile: +91 9160020737
ttps://mits.ac.in/facultyprofile/377
ोकाः समस्ताः सुखिनो भवन्तु॥

lated syllabuses and MoM for the BoS meeting

tua <diqac@jntua.ac.in>
-24 3:16 PM
emistry Department <chemistryhod@mits.ac.in>

h Bhaskaran,

d syllabus and minutes are gone through and which is updated as per the BoS discussions. I am approving l syllabus and minutes which can be implemented with effect from the academic year 2024-25.

gards

.SUBBA REDDY,

Quality Assurance Cell (IQAC),
iversity Anantapur (JNTUA),
puramu - 515 002
Pradesh, INDIA.
ntua.ac.in
4872664
ua.ac.in

Jul 30, 2024 at 11:56 AM HoD-Chemistry Department <chemistryhod@mits.ac.in> wrote:

ed BoS Members,

request you to find attached the minutes of the meeting conducted during the recent virtual BoS meeting the 24th of this month. Additionally, please find attached the updated syllabuses for your reference.

st you to review the contents and send us your approval via email.

r information, the honorarium details have been submitted to the accounts section and will be processed one week. Thank you all once again for your invaluable support.

gards,

---

jith Bhaskaran,
t Professor & Head
nent of Chemistry,
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समस्ताः सुखिनो भवन्तु॥