

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

(UGC Autonomous Institution, Approved by AICTE, New Delhi &Affiliated to JNTUH, Hyderabad). Accredited 2nd time by NAAC with 'A' Grade, Maisammaguda (H), Medchal-Malkajgiri District, Secunderabad, Telangana State – 500100, www.mrec.ac.in

Date: 21-07-2021

Department of Chemistry

Board of Studies meeting held on 21.07.2021 at 3:00 PM

The Board of Studies meeting for the Department of Chemistry isconvened on 21.07.2021 at 3:00 PM through online mode in the conference hall, Malla Reddy Engineering College (Autonomous), Hyderabad.

The Agenda of the meeting is as follows.

AGENDA

- 1. Action Taken Report (ATR) on previous BoS Meeting in A.Y 2020-21
- 2. Discussion and review of Chemistry subjects of B. Tech. MR21 regulations syllabus.
- 3. Suggestion and review of panel for Paper setters, and examiners for examinations.
- 4. Suggest methodologies for innovative teaching and evaluation techniques.
- 5. Suggestion of any activity related to research, teaching, extension and other academic activities in the department/college.
- 6. Delegation of power to the Chairman-BOS based on recommendations of the internal committee, for the inclusion and exclusion of any item as per requirements.
- 7. Approval of any other item with the permission of the Chairman.

(Dr. M. Vijaya Bhaskar Reddy) Chairman – BOS- Chemistry



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Minutes of Meeting Chemistry BOS

21st July, 2021

The Board of studies meeting for the Chemistry is conducted on 21-07-2021 at 3:00 PM in the conference hall, Malla Reddy Engineering College (Autonomous), through online mode by Zoom meet, Hyderabad

The following BOS Members have attended the Meeting:

S. No	Name of the Member	Designation & Official Address	Category
1	Dr. M. VijayaBhaskar Reddy	Assoc. Prof. & HOD, Department of Chemistry, MREC(A)	ubrely
2	Dr. K. Vidya	Assistant Professor, Department of chemistry, Student's Advisor, JNTUHCEJ, JNTUH College of Engineering Jagtial,	onLine
3	Dr. P. Veerasomaiah	Professor of Chemistry, O.U, Hyderabad.	ONLINE
4 .	Dr.Srinivasa raoYaragorla	Assistant Professor School of Chemistry, University of Hyderabad	ONLINE
5	Dr. P. Samba Siva Reddy	M.D, Alta Vista Phyto Chemicals Pvt Ltd, Hyd.	ONLINE
6	Dr. Ch. Mahender	Asst. Prof., MREC(A)	CAR
7	Dr. T. Susmitha	Asst. Prof., MREC(A)	fignithe
8	Mr. D.Venkat Ramulu	Asst. Prof., MREC(A)	RU-
9	Mr. T. Ramesh	Asst. Prof., MREC(A)	M.
10	M.V.Shruthi	Asst. Prof.,SCETW	ONLINE

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)



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The following BOS Members have attended the Meeting:

S. No	Name of the Member	Designation & Official Address	Category
1	Dr. M. VijayaBhaskar Reddy	Assoc. Prof. & HOD, Department of Chemistry, MREC(A)	Chairman - BOS
2	Dr. K. Vidya	Assistant Professor, Department of chemistry, Student's Advisor, JNTUHCEJ, JNTUH College of Engineering Jagtial,	University Nominee
3	Dr. P. Veerasomaiah	Professor of Chemistry, O.U, Hyderabad.	Subject Expert (outside the Parent University)
4	Dr.Srinivasa raoYaragorla	Assistant Professor School of Chemistry, University of Hyderabad	Subject Expert (outside the Parent University)
5	Dr. P. Samba Siva Reddy	M.D, Alta Vista Phyto Chemicals Pvt Ltd, Hyd.	Industry Expert
6	Dr. Ch. Mahender	Asst. Prof., MREC(A)	Faculty Member
7	Dr. T. Susmitha	Asst. Prof., MREC(A)	Faculty Member
8	Mr. D. Venkat Ramulu	Asst. Prof., MREC(A)	Faculty Member
9	Mr. T. Ramesh	Asst. Prof., MREC(A)	Faculty Member
10	M.V.Shruthi	Asst. Prof.,SCETW	Alumni

The following is the agenda of the meeting:

- 1. Action Taken Report (ATR) on previous BoS Meeting in A.Y 2020-21
- 2. Discussion and review of Chemistry subjects of B. Tech. MR21 regulations syllabus.
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- 5. Suggestion of any activity related to research, teaching, extension and other academic activities in the department/college.
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- 7. Approval of any other item with the permission of the Chairman.

At the outset, Dr. M. Vijaya Bhaskar Reddy, HOD and Chairman of the Chemistry - Board of Studies, welcomed the members to the BOS meeting and informed the purpose of the meeting. He also briefed about the previous BOS meeting resolutions and placed on record the existing syllabus of MR21 regulations and also proposed modifications in the syllabus.Later Board of studies Members have in detailed discussion, reviewed each item of the proposed agenda and finally the following items have been resolved unanimously by all the members of BOS.

The following resolutions are made after careful discussion regarding the observations to be implemented in the next Regulations.

- 1. BOS committee members suggested to include numerical problems on EDTA in Module I.
- 2. BOS committee members suggested to include zeolite process in external treatment methods of Module I.
- 3. BOS Committee suggested to remove lime soda numerical problems in Module I.
- BOS committee members suggested to include MOT diagram of hetero diatomic molecules
 'CO' in module II.
- 5. BOS committee members suggested to include 'Crystal field splitting of transition metal complexes for square planar compound ([NiCN₄]²⁻.
- BOS committee members suggested to add 'Quinhydrone electrode and lithium cell' in module III.
- 7. BOS committee members suggested to add 'Pitting and Intergranular corrosion' in types of corrosion in module III.
- 8. BOS committee members suggested to include 'Tinning and Cementation' in surface coating methods in module III.
- 9. BOS Committee members suggested to include 'Addition reactions' and 'Synthesis of ibuprofen' in module IV.
- 10. BOS Committee members suggested to remove named reactions in module IV (Beckmann rearrangement, Cannizaro reaction and Diels –Alder reaction)
- BOS Committee members suggested to remove coupling constant and spin-spin coupling in Module IV.
- 12. BOS Committee members suggested to include 'Introduction, classification and basic principle of UV,IR, NMR and their applications'in module IV.

- 13. BOS Committee members suggested to include 'Bergius process', 'Analysis of Flue gas by Orsat's method'. (Non conventional energy sources-solar wind, hydro power and biomass energy and their applications' in Module V.
- 14. BOS Committee members suggested to include lab reference books in engineering chemistry lab syllabus.
- 15. BOS Committee members suggested to include 'Bio-geochemical cycles (Carbon cycle & Nitrogen cycle), Bio-accumulation, Bio-magnification, ecosystem value services and carrying capacity' in Module I.
- 16. BOS committee members suggested to add 'India as a mega diversity nation, Hot spots of biodiversity' in Module II.
- 17. BOS Committee members suggested to include 'BOD and COD. Waste water Treatment methods: Primary, secondary and Tertiary, STP's. Overview of air pollution control technologies, Concepts bioremediation' in Module III.
- 18. BOS Committee members suggested to remove 'Tg and Tm concept' in Module I of open elective POLYMER CHEMISTRY.

BOS-CHAIRMAN (Dr.M.Vijaya Bhaskar Reddy)

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Teo	ch
Code: B0B17	Engineering Chemistry	L	Т	Р
Credits: 4	(Common for ALL)	3	1	-

Course objectives:

The purpose of this course is to emphasize the relevance of fundamentals of chemical sciences in the field of engineering and to provide basic knowledge on atomic- molecular orbital's, electrochemistry, batteries, corrosion and the role of water as an engineering material in domestic-industrial use. They will also impart the knowledge of stereochemistry, understanding the chemical reaction pathwaymechanisms and synthesis of drugs. Listing out various types of fuels and understanding the concept of calorific value and combustion.

Module I: Water and its treatment

Introduction to water, hardness of water, causes of hardness, expression of hardness, units and types of hardness-Numerical Problems. Alkalinity of water, specifications of potable water (BIS); Estimation of temporary & permanent hardness of water by EDTA methods, <u>Numerical problems on EDTA</u>. Boiler troubles - Scale &Sludge, Priming and foaming, caustic embrittlement and boiler corrosion; Treatment of boiler feed water - Internal treatment (colloidal, phosphate, carbonate and calgon conditioning). External treatment - <u>Zeolite process</u>, Lime Soda process (cold & hot) and ion exchange process, Disinfection of water by chlorination and ozonization. Desalination by Reverse osmosis and its significance.

Module II: Molecular structure and Theories of Bonding:

Introduction to Molecular orbital Theory. Linear Combination of Atomic Orbital's (LCAO), significance of bonding and anti-bonding molecular orbital, Conditions for the formation of molecular orbital's. Molecular orbital energy level diagrams of homo and <u>hetero diatomic molecules</u> -, N₂,O₂, F₂ and \bigcirc Introduction to coordination compounds-ligand-coordination number (CN) - spectrochemical series. Salient features of crystal field theory, Crystal field splitting of transition metal complexes octahedral in ($[CoF_6]^{3-}$ and $[Co(CN)_6]^{3-}$),tetrahedral ($[NiCl_4]^{2-}$ and $[Ni (CO)_4]$) and square planar ($[NiCN_4]^{2-}$ fields - magnetic properties of complexes. Band structure of solids and effect of doping on conductance.

Module III: Electrochemistry and Corrosion

A. Electrochemistry:

Introduction to Electrochemistry-Conductance(Specific and Equivalent) and units. Types of cellselectrolytic & electrochemical cells (Galvanic Cells)-Electrode potential-cell potential (EMF).Electrochemical series and its applications,Nernst equation its applications and numerical problems. Reference electrodes - Calomel Electrode <u>quinhydrone electrode</u> and Glass electrodedetermination of pH using glass electrode. Batteries: Primary (dry cells),**lithium cell** and secondary (Lead-Acid cell, Ni-Cd cell) - applications of batteries. Fuel cells: Hydrogen - Oxygen fuel cell and its applications.

B. Corrosion:

Causes and effects of corrosion: Theories of corrosion - Chemical & Electrochemical corrosion,

[12 Periods]

[12 Periods]

[7 Periods]

[7 Periods]

Pilling-Bedworth rule, Types of corrosion: Galvanic corrosion, <u>pitting corrosion, intergranular</u> <u>corrosion</u> and Water-line corrosion. Factors affecting rate of corrosion-Nature of metal and Nature of Environment, Corrosion control methods - Cathodic protection (Sacrificial anodic and impressed current cathodic methods). Surface coatings: Methods of metallic coatings - hot dipping (Galvanization), <u>Tinning, Cementation</u>, Electroplating (Copper) and Electroless plating (Nickel).

Module IV: Stereochemistry, Reaction mechanism& synthesis of drug molecules and NMR spectroscopy: [12 Periods]

Introduction to Isomers - classification of isomers - structural (chain, positional & functional) and stereoisomerism-geometrical (cis-trans & E-Z system) - characteristics of geometrical isomerism, optical isomerism (chirality - optical activity, specific rotation, enantiomers and diastereomers) of tartaric acid and lactic acid. Conformational isomerism ofn-Butane. Introduction to bond cleavage (homo & hetero cleavage) - reaction intermediates and their stability. Types of organic reactions – addition reactions, Mechanism of substitution (SN^1 & SN^2) and (E_1 & E_2) reactions with suitable example. Synthesis of Paracetamol, Aspirin and ibuprofen their applications.

Introduction to Spectroscopy, <u>classification and basic principle of UV,IR,NMR and their</u> <u>applicatons</u>.*Basic* concepts of nuclear magnetic resonance spectroscopy, chemical shift .

UNIT-V Fuels and Combustion

[12 Periods]

Fuels: Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking – types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process and **Bergius process.** Gaseous fuels – composition and uses of natural gas, LPG and CNG. **Combustion:**Definition, Calorific value of fuel – HCV, LCV; Calculation of air quantity required for combustion of a fuel. Determination of calorific value by Junkers gas calorimeter-Numerical problems on combustion.<u>Analysis of Flue gas by Orsat's method.</u>

Non conventional energy sources-solar, wind, hydro power and biomass energy and their applications.

Text Books:

- 1. P.C.Jain and Monica Jain, "A Text Book of Engineering Chemistry", DhanpatRai Publications, New Delhi, 16th Edition 2014.
- 2. S.S. Dara and S.S. Umare, "A Text Book of Engineering Chemistry", S Chand Publications, New Delhi, 12th Edition 2010.
- 3. A.Jaya Shree, "Text book of Engineering Chemistry", Wiley, New Delhi, 2018.

Reference Books:

- 1. B.Rama Devi, Ch.VenkataRamana Reddy and PrasanthaRath, **"Text Book of Engineering chemistry"**, Cengage Learning India Pvt.Ltd, 2016.
- 2. M.G. Fontana and N. D. Greene, "Corrosion Engineering", McGraw Hill Publications, New York, 3rd Edition, 1996.
- 3. K. P. C. Volhardt and N. E. Schore, "Organic Chemistry: Structure and Function", 5thEdition, 2006.

e-Resources:

a) Concerned Website links:

- 1) https://books.google.co.in/books?isbn=0070669325 (Engineering chemistry bySivasankar).
- 2) https://www.youtube.com/watch?v=yQUD2vzfgh8 (Hot dipping Galvanization).

3)https://archive.org/stream/VollhardtOrganicChemistryStructureFunction6th/Vollhardt_Organic_C hemistry_Structure_Function_6th_djvu.txt.

b) Concerned Journals/Magazines links:

1) http://americanhistory.si.edu/fuelcells/sources.htm (Fuel Cell Information Sources)

2) https://www.abctlc.com/downloads/courses/WaterChemistry.pdf (Water Chemistry)

c) NPTEL Videos:

1) nptel.ac.in/courses/113108051/ (corrosion & electrochemistry web course)

2) https://www.youtube.com/watch?v=V7-8EOfZKeE (Stereochemistry)

Course Outcomes:

After completion of the course students will be able to:

1. Understand water treatment, specifically hardness of water and purification of water by various methods.

2. Analyze microscopic chemistry in terms of atomic and molecular orbital's splitting and band theory related to conductivity.

3. Acquire knowledge on electrochemical cells, fuel cells, batteries and their applications.

4. Acquire basic knowledge on the concepts of stereochemistry, reaction mechanisms and interpretation of NMR in organic molecules.

5. Acquire the knowledge of various fuels and identify a better fuel source of less pollution.

	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1- Weak														
COs					PSO s										
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO 2	PSO 3
C01	3	3	1	2	2										
CO2	2	1		2	1										
CO3	3	3	2	2	1		2								
CO4	3	1	1	1	2	1	3								
CO5	3	3	3	1			3								

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tec	ch.
Code: B0B18	Engineering Chemistry Lab	L	Т	Р
Credits: 1	(Common for ALL)	-	-	2

Course objectives:

To provide the students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

List of Experiments:

- 1. Calibration of Volumetric apparatus.
- 2. Estimation of Total Hardness of water by EDTA Method.
- 3. Estimation of an acid by P^Hmetry.
- 4. Estimation of alkalinity of water.
- 5. Estimation of strength of an acid by Conductometry.
- 6. Estimation of strength of an acid by Potentiometry.
- 7. Estimation of Mn⁺²ion in KMnO₄ by Colorimetry.
- 8. Determination of viscosity of given liquids by Ostwald's viscometer.
- 9. Determination of surface tension of given sample using stalagmometer.
- 10. Estimation of iron (II) by dichrometry.
- 11. Determination of rate constant of hydrolysis of methyl acetate.
- 12. Preparation of Aspirin.

Text Books:

- 1) Practical Engineering Chemistry Manual by Mukkanti K,BS Publications.
- 2) Practical Engineering Chemistry Manual by Dr Bharathi kumari.Y, VGS Publications.

Reference Books: Engineering chemistry laboratory manual by Dr A. Ravi Krishnan, Dr.T.V Reddy, M.Raja Reddy, Sri Krishna Hitech publishing company pvt Ltd.

Course outcomes:

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

- 1. Students will acquire knowledge about the chemistry lab, kind of experiments that can be performed and the precautions to perform four types of titrations & understand the principle involved in the applications of the method.
- 2. Learn and apply basic technique used in chemistry laboratory for estimation hardness & alkalinity of water.
- 3. Understand about mineral analytic technique for estimation of ions/metal ions in minerals.
- 4. Apply instrumental techniques such as colorimetry, conductometry & potentiometry.
- 5. Learn to determine physical properties like free chlorides in water, viscosity & surface tension.

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			(3/2/1)	indic	ates st	rengt	h of co	orrelat	tion) 3	8-Stron	g, 2-M	edium,	1-				
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CO		Programme													PSO		
COs	Outcomes(POs)													S			
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	1	2	3	4										2	3		
CO1	3	2	1	1													
CO2	2	1	2														
CO3	2	2		1													
CO4	2	2	1														
CO5	2	1	2														

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Teo	ch
Code: B00M2	ENVIRONMENTAL SCIENCE	L	Т	Р
Credits: Nil	(Common for ALL)	3	-	-

Pre-requisite: Nil

Course Objectives:

An interdisciplinary approach to complex environmental problems using basic tools of the natural and social sciences, including geo systems, biology, chemistry, economics, political science and international processes. The ability to work effectively as a member of an interdisciplinary team on complex problem of environment.

Module I: Ecosystems:

Definition, Scope and Importance of ecosystem, Concept ofecosystem, Classification of ecosystems, Structure and Structural Components of anecosystem, Functions of ecosystem, Foodchains, foodwebsandecological pyramids. Bio-geochemical cycles (Carbon cycle & Nitrogen

cycle), Bio-accumulation, Bio-magnification, ecosystem value services and carrying capacity, Flow of energy.

Module II: Natural resources, Biodiversity and Biotic resources:

Natural Resources:

Classification of Resources: Living and Non-Living resources, Renewable and non-renewable resources. Water resources: use and overutilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources-casestudies. Energyresources: growing energy needs, introduction to renewable and non-renewable energy sources.

Biodiversity and Biotic resources:

Introduction, definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptiveuse, productive use, social, ethical, aestheticand intrinsic values. India as a mega diversity nation, Hot spots of biodiversity. Threats to Biodiversity (habitatloss, poaching of wildlife, man-wild life conflicts). Conservation of Biodiversity (In-situ and Ex-situ conservation),

Activity: case studies.

Module III: ENVIRONMENTALPOLLUTIONANDCONTROL: [6+4 Periods]

A)Classification of pollution and pollutants, Causes, effects and control technologies. AirPollution:Primary and secondary pollutants, Automobile and Industrial pollution Ambient air quality standards.Water pollution:Point and non-point sources of pollution, Major pollutant of water and their sources, drinking water quality standards. BOD and COD. Waste water Treatment

[6 Periods]

[4 Periods]

[7 Periods]

methods: Primary, secondary and Tertiary, STP's. Overview of air pollution control technologies, <u>Concepts bioremediation.</u>

B) Soil Pollution Soil as sink for pollutants, Impact of modern agriculture on soil, degradation of soil.

Marine Pollution: Misuse of International water for dumping of hazardous waste, Coastal pollution due to sewage and marine disposal of industrial effluents.E-waste and its management.

Activity: Field visit.

Module IV: Global Environmental Problems and Global effects]: [06 Periods]

Greenhouse effect, Green House Gases (GHG), Global Warming, Sea level rise, climate change and their impacts on human environment.Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification.Internationalconventions/Protocols:Earthsummit,Kyotoprotocol and Montréal Protocol.

Activity: Poster Making.

Module V: Sustainable development:

Concept of Sustainable Development, Threats to Sustainability, Population and its explosion, Crazy Consumerism, Over-exploitation of resources, Strategies for Achieving Sustainable development, Environmental Education, Conservation of Resources, Urban Sprawl, Sustainable Cities and Sustainable Communities, Human health, Role of IT in Environment, Environmental Ethics, Environmental Economics, Concept of Green Building, Clean Development Mechanism(CDM).

Text Books:

- 4. R.Rajagopalan, "Environmental Studies from crisis to cure", Oxford University Press 2nd Edition, 2005.
- 5. AnubhaKaushik, C.P.Kaushik, **"Environmental studies"** New age International Publishers,4th Edition,2012

Reference Books:

- 1. ErachBharucha, "Environmental studies" University Grants Commission, and University Press, IEdition, 2005.
- 2. M.Anji Reddy "Text book of Environmental Science and Technology" 3rd Edition, 2007
- 3. Richard T.Wright, "Environmental Science: towards a sustainable future" PHL Learning, Private Ltd. New Delhi, 2nd Edition., 2008
- 4. Gilbert McMasters and Wendell P.Ela, "Environmental Engineering and science", 3rd Edition, PHI Learning Pvt. Ltd., 2008.

Course Outcomes:

After completion of the course, students will be able to:

- 1. To enable the students to realize the importance of ecosystem, its structure, services. To make the students aware of Different natural functions of ecosystem, which helps to sustain the life on the earth.
- 2. To use natural resources more efficiently.

[06 Periods]

- 3. To make the students aware of the impacts of human actions on the environment, its effects and minimizing measures to mitigate them.
- 4. To educate the students regarding environmental issues and problems at local, national and international level.

	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs				PSOs											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	3		1		1	2	1								
CO2	2	3	2	3	1	3		2							
CO3	3	3	2	3	2	2		1							
CO4	3	2	2	1	2	1									
CO5	2	1	1			1	3	3							

5. To know more sustainable way of living.

OPEN ELECTIVES

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Teo	ch
Code: B0B19	CHEMISTRY IN DAILY LIFE	L	Т	Р
Credits: 3	(Common for ALL)	3	-	-

Course Objectives:

1. Understanding the concept of food additives, artificial sweeteners, flavors and their analysis of dairy products and beverages.

2. Acquiring the knowledge of paints pigments, dyes and fertilizers.

3. Acquiring knowledge of Carbohydrates, Proteins and vitamins.

4. Understanding the concept of Oils, fats and acquiring knowledge of different drugs.

5. Conceptual knowledge of Colloids and surfactants.

Module-I

[10 periods]

Dairy Products: Composition of milk and milk products. Analysis of fat content, minerals in milk and butter.Estimation of added water in milk.

Beverages: Analysis of caffeine in coffee and tea, detection of chicory in coffee, chloral hydrate in toddy, estimation of methyl alcohol in alcoholic beverages.

Food additives, adulterants and contaminants- Food preservatives like benzoates, propionates, sorbates, disulphites.

Artificial sweeteners: Aspartame, saccharin, dulcin, sucralose and sodium cyclamate. Flavours: Vanillin, alkyl esters (fruit flavors) and monosodium glutamate.

Module-II

Paints & Pigments: White pigments (white lead, ZnO, lithopone, TiO₂). Blue, red, yellow and green pigments. Paints and distempers: Requirement of a good paint. Emulsion, latex; luminescent paints. Fire retardant paints and enamels, lacquers. Solvents and thinners forpaints.

Dyes: Colour and constitution (electronic concept). Classification of dyes.Methods of applying dyes to the fabrics.A general study of azo dyes, Mordant brown, Congo red and methylorgane. Feritlisers: Classification of Fertilizers- Straight Fertilizers, Compound/Complex Fertilizers, Fertilizer Mixtures. Manufacture and general prosperities of Fertilizer products- Urea and DAP.

Module-III

Carbohydrates: Structure, function and Chemistry of some important mono and disaccharides. Proteins: Introduction to amino acids, peptide bond, polypeptides, proteins, structure of primary, secondary, tertiary and quaternary Proteins, denaturation of proteins.

Vitamins: Classification and Nomenclature. Sources, deficiency diseases and structures of Vitamin A_1 , Vitamin B_1 , Vitamin C, Vitamin D, Vitamin E

Module-IV

[10 periods]

[10 periods]

[10 periods]

Oils and fats: Composition of edible oils, detection of purity, rancidity of fats and oil. Tests for adulterants like argemone oil and mineral oils.
Drugs: Classification and nomenclature. Structure and functions of:
Analgesics – Aspirin, Paracetamol
Anthelmentic drug – Mebendazole
Anti allergic drug- Chloropheniramine maleate
Antiboitics – Pencillin V, Cholomycetin
Anti inflammatory agent- Oxyphenbutazone

Anti malarial - Chloroquine

Module-V:

[10 periods]

Colloids and surfactants:Introduction to solution-types of colloids-characteristics of lyophilic and lyophobic solutions-preparation of colloids (Dispersion methods & Aggregation methods)-purification of colloids (Dialysis, Electrodialysis and Ultrafiltration).Characteristics of colloidal solutions-coagulation of colloids-origin of charge on colloids-protective colloids-emulsions-gels-applications of colloids. Introduction to surfactants-classification of surfactants-CMC (critical micelle concentration)-HLB scale-detergents-cleaning action.

References :

- 1. B. K. Sharma: introduction to Industrial Chemistry, Goel Publishing, Meerut (1998).
- 2. Medicinal Chemistry by AshtoushKar.
- 3. Drugs and Pharamaceutical Sciences Series, Marcel Dekker, Vol. II, INC, New York.
- 4. Analysis of Foods H.E. Cox: 13. Chemical Analysis of Foods H.E.Cox and pearson.
- 5. Foods: Facts and Principles. N. Shakuntala Many and S. Swamy, 4th ed. New Age International (1998)
- 6. Handbook on Feritilizer Technology by Swaminathan and Goswamy, 6th ed. 2001, FAI.

Course Outcomes:

1. Understand the concept of food products and their analysis.

2. Acquire the knowledge of paints, pigments, dyes and fertilizers.

3. Understand the structure and functions of Carbohydrates and Proteins and acquire the

knowledge on different types of Vitamins and their functions.

4. Understand the concept of Oils, fats and acquire knowledge of different drugs with examples.

5. Understand the characteristics of colloids and classification of surfactants.

	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COa				PSOs											
COS	PO	PO	PO	PO	PO	PO6	PO	PO8	PO9	PO10	PO11	PO1	PSO	PSO	PSO
	1	2	3	4	5		7					2	1	2	3
CO1	3	2	3	2	2		1								
CO2	3	2	3	2	2		2								
CO3	3	1	3	1	2		3								
CO4	2	1	3	1	2		3								
CO5	2	2	2	1	2										

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)]	B.Tec	h.
Code: B0B20	NANO CHEMISTRY	L	Т	Р
Credits: 3	(Common for ALL)	3	-	-

Course Objectives:

The objective is to make the learners know about the scope of nano scale materials and their versatile properties. To give knowledge of various instrumental techniques to the analysis the nano materials. To make aware of the learners of different applications of nano materials.

Module-I:Synthesis of Nano materials

Introduction -synthesis of nano structure materials, Bottom-up approach and Top-down approach with examples-sol-gel method-solvothermal and hydrothermal routes, Chemical Vapor Deposition and precipitation methods.

Module-II: Properties of nano materials

Properties of nano materials-Electronic properties, Energy bands and gaps in semiconductors, Fermi surfaces-Optical properties- Fluorescence, Photoluminescence, Electroluminescence, Magnetic properties-mechanical properties-thermal properties.

Module-III: Instrumental Analysis

A) Characterization techniques- Principle and block diagram of Scanning Electron Microscopy(SEM), Electron Dispersion Spectroscopy (EDS)

B) Principle and block diagram of Electron Microscopy (TEM), Dynamic Light Scattering (DLS) and Atomic Force Microscopy(AFM) -Illustrative examples.

Module-IV: Carbon Nano structures and Applications [10 Periods]

Carbon nano structures, carbon clusters, types and preparation of carbon nano tubes-optical and telecommunication applications, nano structured crystals (graphite), graphene, carbon fibers, fullerenes and their applications. Nano solar cells and its applications

Module-V: Environmental Nano technology

Implications of Nano technology & Research needs-Nano structured Catalysts TiO₂ Nano particles for Water purification- Nano membranes in drinking water treatment and desalination, Nano membranes in Sea desalination-Nano particles for treatment of Chlorinated Organic Contaminants.

[10 Periods]

[8 Periods]

[10 Periods]

[9 Periods]

Text Books:

- 1. Mark A. Ratner, D. Ratner. "Nano technology a gentle introduction to the next big idea", Pearson Education Inc., Asia, 2003.
- 2. Pradeep.T. "Nano: The essentials-understanding nano science and nano technology". Tata Mc.Graw Hill, New Delhi, 2007.

Reference Books:

- 1. A. K. Haghi, Ajesh K. Zachariah, NandakumarKalariakkal. "Nano materials: Synthesis, Characterization, and Applications". Apple Academic Press, 2013.
- 2. Brechignac C., Houdy P., Lahmani M. (Eds.) "Nano materials and Nano chemistry" (Springer,) 748p. ISBN 978-3-540-72993-8, 2007
- 3. Phanikumar. "Principles of nano technology", Scitech Publications 2nd Edition, 2010.
- 4. Preetijain, Shankar lalGarg. "Environmental Nano technology" Lap lambert Academic publishing, 2015.

Course Outcomes:

After completion of the course, students will be able to:

- 1. Students will learn the different synthetic methods of the nano materials.
- 2. To know the student Electronic, optical and magnetic properties of nano materials.
- 3. To acquire the knowledge various instrumental methods of analysis (TEM, EDS, SEM, DLS &AFM).
- 4. The students can come to know the carbon nanotubes, carbon nano fibers, nano structured catalysts and nano solar cells.
- 5. Students will learn usage of nano materials in the purification of water.

	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COa				PSOs											
COS	PO	PO	PO	PO	PO	PO	PO	PO8	PO9	PO10	PO11	PO1	PSO	PSO	PSO
	1	2	3	4	5	6	7					2	1	2	3
CO1	2	1			1										
CO2	1		2	1											
CO3	1	2		2	1										
CO4	2		2	1											
CO5	1	2			1	2	1								

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.			
Code: B0B21	POLYMER CHEMISTRY	L	Т	Р	
Credits: 3	(Common for ALL)	3	-	-	

Course Objectives:

The subject provides an introduction to polymer science along with the synthesis of macromolecules by step-growth and chain-growth polymerization. Compounding of polymers and different fabrications methods are discussed. Molecular weight determination of polymers is shown using gel permeation chromatography. An overview of biodegradable and conducting polymers is also given.

Module I: Introduction to Polymer Chemistry

Definitions-Origin, Monomers and its requirements - Broad classification of polymers- types based on structure (homo & copolymers), processing (thermo plastics & thermosetting plastics) and applications. Molecular force and chemical bonding in polymers - tacticity. Determination of molecular weight (MW)-methods for number average- weight average-PDI(poly dispersity index)-effect of polymerization on PDI.

Module II: Polymerization mechanism

Chain growth Polymerization – Addition Polymerization – Reaction Mechanism - Free Radical Reaction – Ionic Reaction – Coordination Polymerization – Ring – Opening Polymerization – Condensation (step) Polymerization – Degree of Polymerization–differences between addition and step growth polymerization. Polymerization techniques -bulk, solution, suspension, emulsionadvantages and disadvantages.

Module III: Compounding of Polymers& fabrication methods

Introduction-compounding of polymers and their functions, selection of additives (by function), improving/modifying the mechanical properties. Fabrication of plastics by compression, injection, transfer, extrusion –moulding, blowing and thermoforming methods.

Module IV: Characterization techniques

Molecular mass by Gel permeation chromatography, Molecular structure by X-ray diffraction, Morphology of polymer using -Scanning Electron Microscopy, Thermal stability using Thermo gravimetric analysis (TGA).

Module V: Biodegradable polymers and conducting polymers

Biodegradable polymers, types, examples: Polyhydroxy butyrate (PHB), Poly-Hydroxybutyrate-coβ-Hydroxyvalerate (PHBV), Polyglycolic acid (PGA), Polylactic acid (PLA), Poly (ε-caprolactone)

[10 Periods]

[10 Periods]

[10 Periods]

[9 Periods]

[9 Periods]

(PCL). Applications of biodegradable polymers. Conducting polymers (poly aniline and poly acetylene)-types-properties-doping-applications.

Text Books:

- 1. P.C.Jain and Monica Jain, "A text Book of Engineering Chemistry", DhanpatRai Publications, New Delhi, 12th Edition 2006.
- 2. S.S. Dara and S.S. Umare, "A Text Book of Engineering Chemistry", S Chand Publications, New Delhi, 12th Edition 2010.
- 3. P. C. Hiemenz and T. P. Lodge. "Polymer Chemistry", 2ndedition, CRC Press, 2007.
- 4. F.W. Billmeyer, "Text Book of Polymer Science", John Wiley & Sons, 4th Edition, 1996.
- 5. V.R. Gowariker, "Polymer Science", New Age International Publisher, 2nd Edition, 2015.

Reference Books:

- 4. B.Rama Devi, Ch.VenkataRamana Reddy and PrasanthaRath, "Text Book of Engineering chemistry", Cengage Learning India Pvt.Ltd,2016.
- 5. PrasanthRath, "Engineering Chemistry", Cengage Learning India Pvt.Ltd, 2015.

e- Resources:

a) Concerned Website links:

1)http://hysz.nju.edu.cn/wangxl/download-polymer/Polymer%20Chemistry%20(Carraher).pdf (polymer chemistry)

2)file:///C:/Users/Admin/Downloads/polymer-science-and-technology.pdf(polymer science and technology)

b) Concerned Journals/Magazines links:

1) European polymer journal (Elsevier publishers)

2) Journal of polymer research (Springer publishers)

c) NPTEL Videos:

- 1) http://nptel.ac.in/courses/104105039/ (Polymer chemistry)
- 2) http://nptel.ac.in/courses/113105028/ (Polymers)

Course Outcomes:

After completion of the course, students will be able to:

- 1. Analyse different mechanisms of polymer formation and use this information in thesynthesis of different polymers.
- 2. Evaluate the effect of factors such as polymer structure, molecular weight, branching and diluents on crystallinity.
- 3. Interpret experimental data and determine the structure of polymers by different techniques.
- 4. Assess the compounding of polymers & fabrication methods.
- 5. To know the student importance of biodegradable and conduction polymers.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO	PO	PO	PO	PO	PO6	PO	PO8	PO9	PO10	PO11	PO1	PSO	PSO	PSO
	1	2	3	4	5		7					2	1	2	3
CO1	1	2		2	1										
CO2	2		1		2										
CO3		2	1	2	1										
CO4	2	1	2												
CO5	2	1		1	2		1								