DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.

CIRCULAR NO.SU/B.Sc./CBC & GS/17/2024

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies/Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technology, **Academic Council at its meeting held on 08 April 2024 has accepted the following Syllabi under the Faculty of Science & Technology as per Choice Based Credit Grading System** as appended herewith.

Sr.No.	Courses	Semester
1.	B.Sc. Chemistry (Optional)	Vth & VIth semester
2.	B.Sc. Analytical Chemistry (Optional)	Vth & VIth semester
3.	B.Sc. Polymer Chemistry (Optional)	Vth & VIth semester
4.	B.Sc.Biochemistry (Optional)	Vth & VIth semester
5.	B.Sc.Dairy Science & Technology (Optional)	Vth & VIth semester
6.	B.Sc.Microbiology (Optional)	Vth & VIth semester
7.	B.Sc. Botany (Optional)	Vth & VIth semester
8.	B.Sc. Computer Science (Optional)	Vth & VIth semester
9.	B.Sc. Computer Science (Degree)	Vth & VIth semester
10.	B.Sc.Information Technology (Optional)	Vth & VIth semester
11.	B.Sc.Information Technology (Degree)	Vth & VIth semester
12.	Bachelor of Computer Application (Optional)	Vth & VIth semester
13.	Bachelor of Computer Application (Degree)	Vth & VIth semester

This is effective from the Academic Year 2024-25 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Chhatrapati Sambhajinagar.
-431 004.
REF.No.SU/2024/1786-94
Date:- 21.06.2024.

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Deputy Registrar,
Academic Section

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Copy forwarded with compliments to :-

1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,

2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

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1] **The Director, Board of Examinations & Evaluation,** Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

2] The Section Officer,[B.Sc.Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

3] The Programmer [Computer Unit-1] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

4] The Programmer [Computer Unit-2] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

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Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhaji Nagar

CBCGS Syllabus

B.Sc. Analytical Chemistry

Semester V & VI

With effect from 2024-25

Prof. Pathan Mohd Arif Ali Khan
Chairman
Board of Studies in Chemistry,
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BSc V Semester
DSC IA (1) Core course (Theory Paper IX)
ACH-511: QA, QC and waste treatment

Credits 02 **45 Lectures**

Quality Assurance **9 Lectures**

Type of industry under the premises, Concept of quality assurance, Total quality management, preparation of audit, conducting audit, audit analysis, audit report, audit follow up, location, design, construction, plant layout, control of contamination.

Quality control **9 Lectures**

Quality control and its concept, QC for laboratories chemical, standardization of labels, contain of label, labeling of reagent, control sample, steps to improve quality, data generation, documentation, preparation of control chart, sampling, inspection, cost reduction

Analysis of cosmetics: **9 Lectures**

Major and minor constituents and their function

a. Analysis of deodorants and antiperspirants, Al, Zn, boric acid, chloride, sulphate.

b. Determination of constituents of talcum powder: Magnesium oxide, Calcium oxide, Zinc oxide and Calcium carbonate by complexometric titration.

Industrial wastes and treatment process **9 Lectures**

The problem of substance and chemical industry, characteristics of industrial waste, types of industrial wastes, principles of industrial waste treatment, treatment and disposal of industrial wastes, effect of waste water on environment, solution to reduce waste water.

Solid waste management: **9 Lectures**

Objectives, concept of recycle, reuse and recovery

Methods of solid waste disposal, Treatment and disposal of sludge / dry cake, Managing non-decomposable solid wastes, Bio- medical waste : Introduction , Classification and methods of disposal

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BSc V Semester

DSC IA (2) Core course (Theory Paper X)

ACH-512 : Applied Chemistry I

Credits 02 **45 Lectures**

Batteries: **8 Lectures**

Primary and secondary batteries, characteristics of an Ideal Battery, principle, working, applications and comparison of the following batteries: Pb- acid battery, Li-metal batteries, Li-ion batteries, Lipolymer batteries, solid state electrolyte batteries, fuel cells, solar cells and polymer cells.

Fuels **8 Lectures**

Fractional Distillation (Principle and process), Cracking (Thermal and catalytic cracking), Reforming Petroleum and non-petroleum fuels (LPG, CNG, LNG, bio-gas, fuels derived from biomass), fuel from waste, synthetic fuels (gaseous and liquids), clean fuels.

Lubricants: **9 Lectures**

Classification of lubricants, lubricating oils (conducting and non-conducting) Solid and semi-solid lubricants, synthetic lubricants. Properties of lubricants (viscosity index, cloud point, pore point and and aniline Point) and their determination

Enzymes and phenolic compound **10 Lectures**

Introduction, general characteristics, extraction of enzyme, extraction of enzyme in water, assay of enzyme, amylases, pepsin, alkaline protease, β-glucosides, Glutamines, Peroxidase (POD), cellulose, in vivo assay method, in vitro assay method. Introduction to phenolic compounds, estimation of total phenolic compounds, estimation of bound phenols, estimation of flavonol.

Analysis of food and food products: **10 lectures**

Composition and analysis of the following (any one suitable method)

a) Milk – Specific gravity, total solid, fat, proteins, lactose, contaminants in milk (QAS, artificial colour and antibiotic).

b) Butter- Sampling, water, salt, curd, lactose, fat, ash, titrable acidity, pH.

c) Wheat flour- Moisture, ash, oil, fat, protein, fiber, acidity, starch and maltose.

d) Meat- Sample preparation, assessment of spoilage of raw meat, total volatile nitrogen extract release voulume, free fatty acids of extractable fat, peroxide value of extractable fat, thiobarbituric value.

e) Beverages- Alcohol contents.

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BSc V Semesters
Core course (Lab course 7)
ACH-521 Analytical Chemistry

Credits 1.5 **60 Lectures**

1. Estimation of ascorbic acid from lemon leaves.
2. Estimation of vitamin-A from the vegetables.
3. Estimate the amount of chlorine.
4. Estimation of phenolic compounds from leave sample.
5 Determination of cholesterol using Liebermann- Burchard reaction.
6 Proteins – qualitative analysis .
7 Isolation of protein from plant materials.
8 Determination of protein by the Biuret reaction.
9 Determination of nucleic acids
10 To prepare biodiesel from vegetable oil
11 Calorific value of a fuel
12. Characterization of different petroleum products using UV and IR
13. To determine pore point and cloud point of fuel
14. To determine the viscosity of biodiesel ay various temperature using biodiesel.
15 To determine free fatty acid content in given sample.
16. To determine the density of the given fuel sample

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BSc V Semester
Core course (Lab course 8)
ACH-522 Analytical Chemistry

Credits 1.5 **60 Lectures**

1. To perform limit test for chloride in given sample of tap water.
2. To perform limit test for chloride in given sample of sodium bicarbonate.
3. To perform limit test for sulphates in the given sample of sodium citrate.
4. To determine and report of the solubility behavior of given sample.
5. Fluorimetric analysis of thiamine hydrochloride and quinine sulphate.
6. Separation of zinc and magnesium using ion exchange chromatography.
7. Estimation of bismuth and lead using xylenol orange as an indicator.
8. Turbedimetric determination of traces of chloride.
9. To determine the physical parameter of waste water.
10 Determination of total soluble sugar from any plant leaves.
11. Extraction of protein from tissues.
12. Determine the percentage of lipids, extracted from fresh tissues.
13. Determination of iodine value of oil.
14. Extraction of enzymes in water or buffer

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Reference book

1. David C, Lee and Michael Webb, Pharmaceutical analysis.
2. B.K Sharma, Industrial chemistry,
3. Harold Koontz, H. Weihrich and A R Aryasri, Principles of management,
4. S L Chopra & J S Kanwar, Analytical agricultural chemistry,.
5. Haward S Gitlow, Alan J Opperheim, Rosa Opperheim, David M Levine Saunders Quality management, 3rd edition College Publishing, Fort Worth (1992).
6. Harris, D. C. *Quantitative Chemical Analysis*, W. H. Freeman.
7. Dean, J. A. *Analytical Chemistry Notebook*, McGraw Hill.
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9. Freifelder, D. Physical Biochemistry *2nd Ed.*, W.H. Freeman and Co., N.Y. USA (1982).
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15. Keith Wilson and John Walker: Practical Biochemistry.
16. Alan H Gowenlock: Varley's Practical Clinical Biochemistry.
17. Thomas M. Devlin: Textbook of Biochemistry.
18. Jeremy M. Berg, John L Tymoczko, Lubert Stryer: Biochemistry.
19. G. P. Talwar and M Srivastava: Textbook of Biochemistry and Human Biology.
20. A.L. Lehninger: Biochemistry.
21. O. Mikes, R.A. Chalmers: Laboratory Handbook of Chromatographic Methods
22. K Sasikumar and Sanoop Gopi, Solid waste management, Krishna PHI publication (2009)
23. Surendra Kkumar, Solid waste management, Northen Book Center (2009)
24. Martin Hocking, Handbook of chemical technology and pollution control 3rd Edn AP Publication (2005).
25. G. S. Sodhi, Fundamental Concepts of Environmental Chemistry, Second Edition , Alpha Science, 2005
26. Thomson The chemistry of natural products, 2nd edition,
27. Alagarsamy, Pharmceutical chemistry of natural products, Elsevier,
28. Thimmaiah, Standard methods of biochemical analysis,
29. Liang & Fang, Medicinal chemistry of bioactive natural products, Wiley India,
30. S.S Agarwal & M. Paridhavi Herbal Drug Technology,
31. Laboratory procedure manual-forensic toxicology directorate of forensic science, MHA Govt. of India.
32. VN Rajasekaran, Pharmaceutical chemistry-II theory and Practical,

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Note **Select any one Skill enhancement course from SEC-3A and SEC-3B**

SEC-3A
(1-Cosmetics)

(Theory Paper Credits: 2, 45 Lectures)

UNIT I

Classification of cosmetic and cosmeceutical products Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals, from cosmetics, cosmetics tis quasi and OTC drugs

Cosmetic excipients: Surfactants, rheology modifiers, humectants emollients, preservatives. Classification and application

Skin: Basic structure and function of skin.

Hair: Basic structure of hair. Hair growth cycle.

Oral Cavity: Common problem a .sociat d with teeth and gums.

UNIT II

Principles of formulation and building blocks of skill care products:

Face wash,

Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of these products in formulation of cosmecuticals.

Antiperspants & deodorants- Actives & mechanism of action.

UNIT III

Principles of formulation and building blocks of Hair care products:

Conditioning shampoo, Hair conditioner, anti-dandruff shampoo.

Hair oils.

Chemistry and formulation of Para-phylene diamine based hair dye.

Principles of formulation and building blocks of oral care products:

Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.

References

1)Harry's Cosmeticolcgy, Wilkinson, Moore, Seventh Edition, George Godwin.
2)Cosmetics - Formulations, Manufacturing and Quality Control, .P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi.
3)Text book of cosmelicology by Sanju Nanda & Roop K, Khar, Tata Publishers.

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SEC 3B

(2- Jam, Jelly, Sauce And Ketchups)

(Theory Paper Credits: 02, 45 Lectures)

Food safety education and training: **7 Lectures**

introduction, need for education and training,

Food Safety and Standards Authority in India (FSSAI): Introduction, functions & duties, provisions for food products

Food laws and regulations: **8 Lectures**

Prevention of food adulteration act (PFA act) - introduction, features of act, implementation Essential Commodity Act (ECA) - Fruit Product Order (FPO), Vegetable Oil Product Order, Export act, Bureau of Indian Standards Act (BIS), Agmark, ISI mark, ISO, FAO, WHO

JAM, JELLY, MARMALADE : **10 Lectures**

Introduction Jam, Jelly, Marmalade, Definition of Jam and Jelly, Difference between Jam and Jelly. Colloidal System in Jelly, Chemistry of Jam making, Structure of Pectins, Colors and Preservatives used in jams, jellies and marmalades.

Sauce and Ketchups Introduction and Colors : **10 Lectures**

Introduction Brief History, Definition and concept of Sauce and Ketchup, Principle, Components and Ingredients of sauces and ketchups, Chemistry of Ketchup, Different Types of Sauce and Ketchups, Difference between Sauce and Ketchup, Additive edible colors types and examples

Preservatives in Sauce and Ketchups, **10 Lectures**

Definition of Chemical Preservatives, their advantages and disadvantages; Use and proportions of different preservatives in Ketchup and Sauces, Edible Colors and their advantages and disadvantages, Different types of Sauces. Technique of Sealing of Bottles or jars for commercial use

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BSc VI Semester

DSC 1A(1) Core course (Theory Paper XI)

ACH-611 : Pharmaceutical Chemistry

Credits 02 **45 Lectures**

Industrial Standards and Legislation **9 Lectures**

Introduction to ISO2000, Agmark, Hallmark, ISI, FDA, USFDA, introduction to ISO, OSHA and FPO, introduction to R & D. Indian pharmacopeia, British Pharmacopeia, US Pharmacopeia, Ayurvedic Pharmacopia introduced by AYUSH, Need of Pharmacopia.

Introduction to drug act, **8 Lectures**

drug rule and regulatory, amendments of FDA and ISO standards, clauses of ISO-9000, need and importance of ISO-9000, implementation of the series of ISO, other standards of goods and cosmetics, documentation and record keeping in pharmaceutical industries.

Pharmaceutical chemistry **10 Lectures**

Introduction to pharmaceutical industries, types of dosage form, Introduction to the pharmaceutical formulation, types of impurities, sources of impurity in pharmaceutical chemicals, difference between impurity and contamination, raw material, standardization of finished product, limit test, solubility test and stability study.

Drug Chemistry **10 Lectures**

Introduction, classification of drug, sources of drug, Assay of Morphine, sulphacteamide, penicillin G, Amphotericin, Pyrimethamine, imipramine, chlorpropamide, paracetamol, Nimuselide, Ranitidine. Limit tests for iron, mercury, cop per, arsenic, chloride and sulphate, Assay of drugs. Lethal dose, significance of LD50 and LC50.

Natural product **8 Lectures**

Introduction to natural product, drug discovery of natural product, classification of natural product, introduction to some aromatic compound such as benzenoid, terphenyls, Flavonoids, Anthraquinones

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BSc VI Semester

DSC 1A(2) Core course (Theory Paper XII)

ACH-612 : Applied analytical chemistry - II

Credits 02 **45 lectures**

Unit I **10 Lectures**

Plastics and Polymers

Classification of plastic, determination of additives, molecular weight distribution, analysis of plastic and polymers based on styrene, vinyl chloride, ethylene, acrylic and cellulosic plastics, Metallic impurities in plastic and their determination, Impact of plastic on environment as pollutant.

Paints and pigments: **10 Lectures**

Types of paints pigments, determination of volatile and non - volatile components, Flash point (significance and method of determination), separation and analysis of pigments, binders and thinners. Role of Organo silicones in paints and their impact on environment.

Diagnostic approach by blood. **9 Lectures**

Blood: Composition and functions of blood, blood coagulation. Blood collection and preservation of samples. Anaemia, Regulation, estimation and interpretation of data for blood sugar, urea, creatinine, cholesterol and bilirubin. serum electrolytes, estimation of blood glucose by folin-Wu method, Astor-King method, estimation of sodium and potassium by flame spectrophotometeric method

Urine: **6 Lectures**

Collection and preservation of samples.

Formation of urine. Composition and estimation of constituents of normal and pathological urine

Forensic Science, **10 Lectures**

Introduction to forensic science, Working pattern of forensic lab, storage of the sample, dissolution, collection of the sample from crime place including blood, semen and saliva (qualitative and quantitative analysis), Viscera, Stomach wash, Toxicology: classification of poison, extraction method of toxicology, analysis of the blood of the post mortem for the poison like As and Hg.

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BSc VI Semester
Core course (Lab course -9)
ACH-621 Analytical Chemistry

Credits 1.5 **60 Lectures**

1. Estimation of ibobrofine from brofine tablet.
2. Assay of benzaldehyde from almond.
3. Assay of boric acid titrimetrically.
4. Estimate the amount of paracetamol
5. To analysis the morphine by TLC.
6. To estimate the amount of iron from the given tablet.
7. To estimate the amount of amino acids by colorimetic method.
8. To analysis the caffeine contained in coffee.
9. To determine the magnesium from the given tablet

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BSc VI Semester
Core course (Lab course -10)
ACH-622 Analytical Chemistry

Credits 1.5 **60 Lectures**

1. Estimate any one micronutrients from blood sample.
2. Estimate the random blood sugar by Folin-Wu method.
3. To estimate the amount cholesterol egg.
4. Estimate the amount protein from egg sample.
5. Colony characteristics and growth pattern of different microorganism.
6. Determination of iron as 8-hydroxy quinolate by solvent extraction method.
7. Estimate the amount of hydrazine iodometrically.
8. Assay of aspirin.
9. Estimate the amount of atenolol from the given tablet.

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Reference book

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Note **Select any one Skill enhancement course from SEC4A and SEC4B**

SEC-4A

(1. Industrial waste water treatment)

(Theory Paper Credits: 02, 45 Lectures)

Wastewater Treatment:

Pre & Primary Treatment - screening, comminuting, grit removal, flow measurement. Primary sedimentation Equalization, Proportioning, Neutralization, Oil separation by Floating-Waste Reduction-Volume Reduction-Strength Reduction. Waste Treatment Methods - Nitrification and De-nitrification-Phosphorous removal –Heavy metal removal, Membrane Separation Process - Air Stripping and Absorption Processes, Special Treatment Methods - Disposal of Treated Waste Water.

Secondary Treatment: Activated sludge. Trickling filters. Stabilisation pond. Up-flow anaerobic sludge blanket reactor.

Tertiary Treatment: Wastewater disposal and reuse. Nutrient removal. Solid removal. Ozone treatment. Reverse osmosis. Ultraviolet filtration. Ion exchange. Wastewater disposal. Water reuse. Concept of common effluent treatment plant (CETP).

Books for Reference:

1) Natural Hazards-Local, National, Global: G. F. White, Oxford University Press.

2) Laboratory Manual for the Examination of Water, Waste water and soil: H. H. Rupa and H. Krist;

VC H Publication

3) Environmental Impact Analysis Handbook: J. G. Rau and D. C. Wooten; McGraw-Hill Book Co.

4) Environmental Impact Assessment, L. W. Canter, McGraw Hill Publication,

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SEC-4B

(2.Purification and Separation techniques)

(Theory Paper Credits: 02, 45 Lectures)

Principles, efficiency and techniques involved in

1. Filtration,
2. Distillation,
3. Fractional distillation
4. Steam distillation
5. Vacuum distillation
6. Solvent extraction

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