

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY



CIRCULAR NO.SU/B.Sc./08/2022

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies and Ad-hoc Boards with recommendation of the Dean, Faculty of Science & Technology, the Hon'ble Vice-Chancellor has accepted the **following syllabi of Bachelor of Science with Regulation under the scheme of Choice Based Credit & Grading System** in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council as appended herewith.

Sr.No.	Courses	Semester
1.	B.Sc.Electronics(Optional)	Ist and IInd semester (First Year)
2.	B.A./B.Sc.Mathematics(Optional)	Ist and IInd semester (First Year)
3.	B.Sc.Chemistry(Optional)	Ist and IInd semester (First Year)
4.	B.Sc.Physics(Optional)	Ist and IInd semester (First Year)
5.	B.Sc.Analytical Chemistry	Ist and IInd semester (First Year)
6.	B.Sc.Geology (Optional)	Ist to VIth semester (First to Third)

This is effective from the Academic Year 2022-23 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,
Aurangabad-431 004.
REF.NO.SU/2022/ 6852-62
Date:- 10.08.2022.

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[Signature]
**Deputy Registrar,
Academic Section**

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.**

Copy to :-

- 1] **The Director, Board of Examinations & Evaluation, Dr.BAMU,A'bad.**
- 2] The Section Officer,[B.Sc.Unit] Examination Branch,Dr.BAMU,A'bad.
- 3] The Programmer [Computer Unit-1] Examinations, Dr.BAMU,A'bad.
- 4] The Programmer [Computer Unit-2] Examinations, Dr.BAMU,A'bad.
- 5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.BAMU,A'bad.
- 6] The Public Relation Officer, Dr.BAMU,A'bad.
- 7] The Record Keeper, Dr.BAMU,A'bad.

**DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
AURANGABAD.**



SYLLABUS

B. Sc. Analytical Chemistry (Semester I to II)

Choice Based Credit System

Effective from : June 2022

Asmita
29/07/22

(Dr. Anil G. Shankarwar)
Chairman BOS Chemistry
Dr. Babasaheb Ambedkar Marathwada University
Aurangabad.

[Signature]
5/08/22
Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Choice Based Credit System (CBCS) Curriculum

For

Faculty of Science and Technology

Course Structure and Scheme of Examination

B.Sc. Three Year Undergraduate Degree Program for Analytical Chemistry

Semester I

	Course Code	Course Title	Teaching time/week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSC-1A) Core Courses	ACH-111	Core Course (Theory Paper-I)	2 hours	2	50	10	40	20
	ACH -112	Core Course (Theory Paper-II)	2 hours	2	50	10	40	20
	ACH-121	Lab course 1 (based on ACH -111 and ACH -112)	3 hours	1.5	50	10	40	20

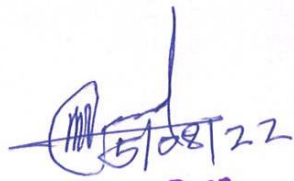
Total Credits for Semester I : 5.5 (Theory : 04 ; Laboratory : 1.5)

Semester II

	Course Code	Course Title	Teaching time/week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSC-1B) Core Courses	ACH -211	Core Course (Theory Paper-III)	2 hours	2	50	10	40	20
	ACH -212	Core Course (Theory Paper-IV)	2 hours	2	50	10	40	20
	ACH -221	Lab course 2 (based on ACH -211 and ACH -212)	3 hours	1.5	50	10	40	20

Total Credits for Semester II : 5.5 (Theory : 04 ; Laboratory : 1.5)

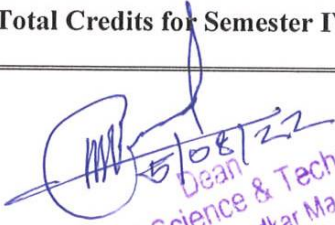

(Dr. Anil G. Shankarwar)
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Semester III

	Course Code	Course Title	Teaching time/week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSC-1C) Core Courses	ACH- 311	Core Course (Theory Paper-V)	2 hours	2	50	10	40	20
	ACH-312	Core Course (Theory Paper-VI)	2 hours	2	50	10	40	20
	ACH -321	Lab course 3 (based on ACH -311)	3 hours	1.5	50	10	40	20
	ACH -322	Lab course 4 (based on ACH -312)	3 hours	1.5	50	10	40	20
Total Credits for Semester III : 07 (Theory : 04 ; Laboratory : 03)								

Semester IV

	Course Code	Course Title	Teaching time/week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSC-1D) Core Courses	ACH -411	Core Course (Theory Paper-VII)	2 hours	2	50	10	40	20
	ACH-412	Core Course (Theory Paper-VIII)	2 hours	2	50	10	40	20
	ACH-421	Lab course 4 (based on ACH-411)	3 hours	1.5	50	10	40	20
	ACH -422	Lab course 5 (based on ACH -412)	3 hours	1.5	50	10	40	20
Total Credits for Semester IV : 07 (Theory : 04; Laboratory : 03)								
 Dean Faculty of Science & Technology Dr. Babasaheb Ambedkar Marathwada University, Aurangabad								

Semester V

	Course Code	Course Title	Teaching time/week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSE-1 A) Discipline Specific Elective	ACH -511	DSE-1A(1) (Theory Paper-IX) (Select any one paper from A1/B1/C1/D1)	2 hours	2	50	10	40	20
	ACH -512	DSE-1A(2) (Theory Paper-X) (Select any one paper from A2/B2/C2/D2)	2 hours	2	50	10	40	20
	ACH -521	Lab course 6 (based on ACH -511)	3 hours	1.5	50	10	40	20
	ACH-522	Lab course 7 (based on ACH -512)	3 hours	1.5	50	10	40	20

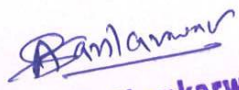
Total Credits for Semester V : 07 (Theory : 04 ; Laboratory : 03)

Semester VI

	Course Code	Course Title	Teaching time/week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSE-1 B) Discipline Specific Elective	ACH -611	DSE-1B(1) (Theory Paper-XI) (Select any one paper from A1/B1/C1/D1)	2 hours	2	50	10	40	20
	ACH -612	DSE-1B(2) (Theory Paper-XII) (Select any one paper from A2/B2/C2/D2)	2 hours	2	50	10	40	20
	ACH -621	Lab course 8 (based on ACH -611)	3 hours	1.5	50	10	40	20
	ACH -622	Lab course 9 (based on ACH -612)	3 hours	1.5	50	10	40	20

Total Credits for Semester VI : 07 (Theory : 04 ; Laboratory : 03)

Total Credits for three years: Sem. I (05.5) + Sem. II (05.5) + Sem. III (07) + Sem. IV (07) + Sem. V (07) + Sem. VI (07) = 39 Credits


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 Chairman BOS Chemistry
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Important Notes:

- i) **Nomenclature:** DSC- Discipline Specific Core course, SEC – Skill Enhancement Course, AECC- Ability Enhancement compulsory course, DSE- Discipline Specific Elective, UA- University Assessment (Semester End), CIA-Continuous Internal Assessment
- ii) **Assessment:** 80% for University Assessment (Semester End Examination) and 20 % for Continuous Internal Assessment (CIA)
- iii) Continuous Internal Assessment (CIA): **Theory** (10 Marks): Internal Test 05 Marks (Two Internal Tests of 05 marks each and average of the two test will be considered) and 05 Marks for Assignment/tutorials.
- iv) Continuous Internal Assessment (CIA): **Practical** (10 Marks): 07 Marks for Internal Practical Examination and 03 Marks for record book/submission of collection and field survey report and excursion report
- v) Practical examination : Annual examination

ACH – 111
**(FUNDAMENTALS OF ANALYTICAL
CHEMISTRY)**

(Theory Credits: 02, Lectures-45)

1. Scope and Importance of Analytical Chemistry **(10Lectures)**

Definition, Role of analytical chemistry, classification of analytical methods – classical and instrumental methods, advantages of instrumental methods. Advantages of chemical methods, limitations of chemical and instrumental methods. Types of analysis: Proximate, Partial, trace, complete analysis. Types of analysis on the basis of complete size and concentrations.

2. Sampling of Analytical Sample **(10Lectures)**

Definition of terms: samples, sampling procedure, universe or population, sampling unit, increment, gross sample, sub-sample. Types of sampling: Non random & random sampling, sampling of gases, sampling of liquids and sampling of solids. Storage and transport of samples.

3. Laboratory Operations and Practices **(12Lectures)**

Filtration, drying, graduated glassware, units of volumes, graduated apparatus, temperature standards. Graduated flasks, pipettes, burettes, weight burettes, piston burettes, measuring cylinders, purified waters, wash bottles, glass wares & plastic wares, metal apparatus, heating apparatus, desiccators, dry boxes, stirring and heating apparatus.

4. Working in Analytical Laboratory

(13 Lectures)

Good laboratory practice, basic laboratory operations, requirements for the suitability of the reactions for use in chemical analysis, rules of work in an analytical laboratory, general safety regulations, handling of reagents, rules for working with harmful substances, rules of fire preventions, prevention of accidents and first aid in laboratory.

References:

1. Textbook of quantitative Inorganic analysis-A.I. Vogel
2. Instrumental methods of Chemical analysis-H. Kaur
3. Instrumental methods of Chemical analysis-B.K. Sharma
4. Instrumental methods of Chemical analysis-Chatwal Anand
5. Fundamental of analytical Chemistry-Skoog and West
6. Basic Concepts of analytical Chemistry-S.M. Khopkar
7. Analytical Chemistry-Alka Gupta (Pragati Prakashan)
8. Advanced Practical Inorganic Chemistry by Gurdeep Raj, Goel Publishing House, Meerut.

ACH – 112
(BASIC CONCEPTS OF ANALYTICAL CHEMISTRY)

(Theory Credits: 02, Lectures-45)

- (10 Lectures)**
- 1. Balance**
Analytical Balance: Constructions and working of mechanical and electronic analytical balance. Weighing with single pan balance, Precautions in using analytical balance. Sources of errors in weighing, Care and use of balance. Weighing and methods of weighing, Calibration of weights.
- (12 Lectures)**
- 2. Chemical Apparatus and Laboratory Note book for Analytical Chemistry**
Classification of chemical reagents, grade (LR grade, AR grade, CP grade, spectroscopic grade) primary standard grade and special purpose reagent and chemicals. Rules for handling reagents, apparatus, cleaning and marking of lab-wares, handling of volumetric flask, Calibration of burette, pipette, volumetric flask.
- (13 Lectures)**
- 3. Chemical Calculations**
Mole concepts: Mole atom, mole molecule, molar volume, molar mass, atomic weight, molecular weight, equivalent weight.
Concentration Units:- Standard solutions, normality, molarity, molality, mole fraction, volume fraction, strength, ppm, ppt.
Stoichiometry.
- (10 Lectures)**
- 4. Reagents, Solvents and their Classification.**
Reagents: Classification of reagents according to their action as Acids, Bases, Salts, oxidizing, reducing, complexing, chelating and precipitating reagents with suitable examples.

Solvents: Classification of Solvents as protic, aprotic and amphoteric solvents, Acidic basic and neutral solvents, polar and non polar solvents, aqueous and non-aqueous solvents. Explanation with suitable examples.

References:

1. Textbook of quantitative Inorganic analysis-A.I. Vogel
2. Instrumental methods of Chemical analysis-H. Kaur
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7. Analytical Chemistry-Alka Gupta (Pragati Prakashan)
8. Advanced Practical Inorganic Chemistry by Gurdeep Raj, Goel Publishing House, Meerut.

ACH – 121
Lab Course – 1
(Credits 1.5: Lectures- 04 per week)

1. Calibration of weight on Single pan balance
2. Calibration of volumetric apparatus like burette, pipette, standard flask.
3. To prepare standard solution of sodium carbonate and standardize the given solution of HCl / H₂SO₄.
4. To prepare standard solution of sodium oxalate and standardize the given solution of KMnO₄.
5. To prepare standard solution of K₂Cr₂O₇ and standardize the given solution of Na₂S₂O₃.
6. To prepare standard solution of sodium chloride and standardize the given solution of AgNO₃.
7. Assay of commercial NaOH
8. Assay of Ferrous Sulphate
9. Assay of Boric acid using Manitol
10. Assay of Copper Sulphate
11. To estimate the amount of barium in the given solution of barium chloride.
12. To estimate the amount of iron in the given solution of ferrous salt.

ACH – 211
**(STATISTICAL TREATMENT AND MODERN METHODS
OF ANALYSIS)**

(Theory Credits: 02, Lectures-45)

1. Data Handling **(15 Lectures)**

Statistical Terms: Mean, median, spread, absolute deviation, average deviation, relative average deviation, precision and accuracy, significant figures and rounding off figures. Errors: Types of errors (Determinant and indeterminate), absolute error, relative error, constant and proportionate errors, standard deviation, coefficient of variation, confidence limit, student test, Rejection of data, Q-test, 2.5-4d rules, Graphical representation of results, method of averages, method of least of squares, numerical problems.

2. Chromatography **(12 Lectures)**

Chromatography as the method of separation, historical development, classification of chromatographic methods, fundamentals of chromatography, special features of chromatographic methods, principles of chromatography (brief), principal, techniques, types and applications of paper chromatography and thin layer chromatography (TLC)

3. Electrophoresis **(10 Lectures)**

Introduction, theory of electrophoresis, types of electrophoresis, moving boundary electrophoresis, zone electrophoresis, Paper electrophoresis, Cellulose acetate electrophoresis, Gel electrophoresis.

4. Flame Photometry **(08 Lectures)**

Principle, Instrumentation and applications of flame photometry.

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1. Textbook of quantitative Inorganic analysis-A.I. Vogel
2. Instrumental methods of Chemical analysis-H. Kaur
3. Instrumental methods of Chemical analysis-B.K. Sharma
4. Instrumental methods of Chemical analysis-Chatwal Anand
5. Fundamental of analytical Chemistry-Skoog and West
6. Basic Concepts of analytical Chemistry-S.M. Khopkar
7. Analytical Chemistry-Alka Gupta (Pragati Prakashan)
8. Chromatography-H. Kaur

(CLASSICAL AND SPECTRAL METHODS OF ANALYSIS)

(Theory Credits: 02, Lectures-45)

1. Titrimetric Methods of Analysis (12 Lectures)

Definition of some important terms:- Titrant, Titrand, Titrations. Indicators, titre value, equivalence point, end point, neutralization point, classification of reactions in titrimetric analysis.

Primary and secondary standards: Definitions, characteristics and uses, Theory of acid base indicators, factors affecting indicator use, neutralization curves.

2. Gravimetric Analysis (15 Lectures)

Introduction, precipitation, filtration, filter papers, filter mats, types of filtering crucible, drying, ignition, incineration of precipitate, nucleation, particle size, crystal growth, colloidal state. Solubility product, principle and its applications, factors affecting solubility of precipitate, aging, co precipitation and post precipitation. Precipitation from homogeneous solution (hydroxide, phosphates, oxalates & sulphates) use of organic and inorganic precipitation reagents.

3. Spectral Method of Analysis (10 Lectures)

Introduction, properties of electromagnetic radiation, regions of the electromagnetic radiation.

UV- Visible Spectroscopy:- Introduction, theory, instrumentations and applications.

Colorimetry:-Introduction, theory, instrumentations, applications.

4. Precipitation Titration (08 Lectures)

Introduction, Mohr's method, Volhard's method, adsorption indicators and its use in precipitation titrations.

References:

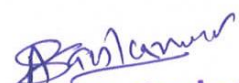
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8. Advanced Practical Inorganic Chemistry by Gurdeep Raj, Goel Publishing House, Meerut.

ACH – 221
Lab Course – 2
(Credits 1.5: Lectures- 04per week)

1. Preparation of 0.1 N solution of HCl, HNO₃ using density and percentage by weight and standardize it by Na₂CO₃
2. Preparation of 0.05 N solutions of H₂SO₄ using density and percentage by weight and its standardization.
3. Provided 0.1 N solution of Acetic acid, Prepare 50 ml of 0.02N acetic acid.
4. Provided 0.1 N FAS solution, prepare 50 ml 0.05 N FAS and standardize it by K₂MnO₄
5. Prepare a working calibration curve using KMnO₄ Solution and determine concentration in the given unknown sample
6. Measure the optical density of series of solution of KMnO₄ and find the equations of line using least square method.
7. Prepare a working calibration curve using CuSO₄ Solution and determine concentration of CuSO₄ in the given unknown sample.
8. To determine the stability constant of Fe-5-Sulpho salicylic acid by Jobs method.
9. Estimation of Na / K by using flame photometer.
10. Estimate the water soluble poly-phenols / Catechin content in various samples of tea leaves.
11. Estimate the amount of Tannic acid present in various samples of tea leaves.



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