DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.SU./B.Sc.CBC & GS/11/2022

It is hereby inform to all concerned that, on the recommendation of Faculty of Science & Technology Meeting dated 24.08.2022, **the Academic Council at its meeting held on 29 August 2022 has accepted the following Syllabi of B.Sc. Degree under the Choice Based Credit & Grading System along with Rules and Regualtion** as appended herewith:-

1.	B.Sc.Computer Science (Optional)	Ist and IInd semester
2.	B.Sc.Computer Application (Optional)	Ist and IInd semester
3.	B.Sc.Computer Application (Degree)	Ist and IInd semester
4.	B.Sc.Computer Science (Degree)	Ist and IInd semester
5.	B.Sc.Horticulture (Optional)	Ist to VIth semester
6.	B.Sc.Botany (Optional)	Ist to VIth semester
7.	B.Sc. Agrochemical & fertilizer (Optional)	Ist to VIth semester
8.	B.Sc.Home Science (Optional)	Ist and IInd semester
9.	B.Sc.Automobile Technology (Degree)	Ist and IInd semester
10.	B.Sc.Workshop Technology (Degree)	Ist and IInd semester
11.	B.Sc.Refrigeration and Air Conditioning (Degree)	Ist and IInd semester
12.	B.Sc.Environmental Science (Optional)	Ist and IInd semester
13.	B.Sc.Biotechnology (Degree)	Ist and IInd semester
14.	B.Sc.Biotechnology (Optional)	Ist and IInd semester
15.	B.Sc.Dairy Sci.& Tech (Optional)	Ist and IInd semester
16.	B.Sc.Zoology (Optional)	Ist to VIth semester
17.	B.Sc.Polymer Chemistry (Optional)	Ist and IInd semester
18.	B.Sc.Fisheries Science (Optional)	Ist and IInd semester
19.	B.Sc.Instrumentation Practice (Optional)	Ist semester
20.	B.Sc.Biochemistry (Optional)	Ist and IInd semester
21.	B.Sc.Non Conventional & Conventional Energy (Degree)	Ist and IInd semester

This is effective from the Academic Year 2022-23 and onwards.

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

University Campus,
Aurangabad-431 004.
Ref.No. SU/B.Sc./2022/8428-35
Date:-29.08.2022.

★
★
★
★
★
★★★★★★

Deputy Registrar,
Academic Section

...2...

::2::

Copy forwarded with compliments to :-

1] **The Principal, concerned affiliated College,**
Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

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,
2] The Section Officer,[B.Sc.Unit] Examination Branch,
3] The Programmer [Computer Unit-1] Examinations,
4] The Programmer [Computer Unit-2] Examinations,
5] The In-charge, [E-Suvidha Kendra],
Rajarshi Shahu Maharaj Examination Branch,
6] The Public Relation Officer,
7] The Record Keeper,

JS*29082022/-

DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

SYLLABUS

B.Sc Biochemistry
(semester I to II)

Choice Based Credit system

Effective from June 2022

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 Biochemistry with effect from June 2022

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	BC -111	Core Course (Theory Paper-I)	2 hours	2	50	10	40	20
	BC -112	Core Course (Theory Paper-II)	2 hours	2	50	10	40	20
	BC -121	Lab course 1 (based on BC -111 and BC -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	BC -211	Core Course (Theory Paper-III)	2 hours	2	50	10	40	20
	BC -212	Core Course (Theory Paper-IV)	2 hours	2	50	10	40	20
	BC -221	Lab course 2 (based on BC -211 and BC -212)	3 hours	1.5	50	10	40	20
Total Credits for Semester II : 5.5 (Theory : 04 ; Laboratory : 1.5)								

Professor & Head
Department of Biochemistry
Dr. Babasaheb Ambedkar
Marathwada University,
Aurangabad.

Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad

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	BC -311	Core Course (Theory Paper-V)	2 hours	2	50	10	40	20
	BC -312	Core Course (Theory Paper-VI)	2 hours	2	50	10	40	20
	BC -321	Lab course 3 (based on BC -311)	3 hours	1.5	50	10	40	20
	BC -322	Lab course 4 (based on BC -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	BC -411	Core Course (Theory Paper-VII)	2 hours	2	50	10	40	20
	BC -412	Core Course (Theory Paper-VIII)	2 hours	2	50	10	40	20
	BC -421	Lab course 4 (based on BC -411)	3 hours	1.5	50	10	40	20
	BC -422	Lab course 5 (based on BC -412)	3 hours	1.5	50	10	40	20
Total Credits for Semester IV : 07 (Theory : 04; Laboratory : 03)								

Professor & Head
Department of Biochemistry
Dr. Babasaheb Ambedkar
Marathwada University.
Aurangabad.

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	BC -511	DSE-1A(1) (Theory Paper-IX) (Select any one paper from A1/B1/C1/D1)	2 hours	2	50	10	40	20
	BC -512	DSE-1A(2) (Theory Paper-X) (Select any one paper from A2/B2/C2/D2)	2 hours	2	50	10	40	20
	BC -521	Lab course 6 (based on BC -511)	3 hours	1.5	50	10	40	20
	BC -522	Lab course 7 (based on BC -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	BC -611	DSE-1B(1) (Theory Paper-XI) (Select any one paper from A1/B1/C1/D1)	2 hours	2	50	10	40	20
	BC -612	DSE-1B(2) (Theory Paper-XII) (Select any one paper from A2/B2/C2/D2)	2 hours	2	50	10	40	20
	BC -621	Lab course 8 (based on BC -611)	3 hours	1.5	50	10	40	20
	BC -622	Lab course 9 (based on BC -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

Professor & Head
Department of Biochemistry
Dr. Babasaheb Ambedkar
Marathwada University,
Aurangabad.

Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad

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

BC-111

(BIOMOLECULES-I)

(Theory credits-02, Lectures-45)

I) History and Development of Biochemistry. Composition of living matter, importance of carbon, origin of life. Prokaryotic and Eukaryotic cells, Structure of Organelles, structure and functions. **(08 Lectures)**

II) **Carbohydrates:** Definition, biological role and classification of carbohydrates, structure of monosaccharide's, stereoisomerism and optical isomerism of sugars, ring structures and anomeric forms, mutarotation, reactions of aldehyde and ketone groups reactions due to hydroxyl groups. Structure, occurrence and biological importance of monosaccharides, (glucose, fructose, galactose) disaccharides (Sucrose, maltose, lactose) and polysaccharides (cellulose, glycogen, starch) and chitin, agar, pectin, Proteoglycans, Sialic acids, blood group polysaccharides. **(15 Lectures)**

III) **Lipids:** Definition, fatty acids nomenclature, structure. Classification of Lipids: simple, complex & derived lipids. Physical properties and chemical properties hydrolysis, Saponification, rancidity of fats, reaction of glycerol. Biological significance of fats. Properties and functions of sterols. **(12 Lectures)**

IV) **Hormones:** Definition, classification, mode of action and target sites, chemistry and function of Pituitary gland, thyroid, parathyroid, adrenal, pancrease, gonands and corpus luteum. **(10 Lectures)**

Reference Book:

1) Lehninger's Principles of Biochemistry (2000) by Nelson, David L. and Cox M.M Machnil Han/Worth N.Y.
2) Biochemistry 3rd (1994) By Lubert Stryer, WH Freeman and Co. San Francisco.
3) Outlines of Biochemistry by Eric E Corn. P.K. stumpff G.Bruening and Ray H Doi, John Wiley and Sons N.Y.
4) Biochemistry (revised 5th edition 2018) by U. Satyanarayan , U.Chakrapani

BC-112

BIOMOLECULES-II

(Theory credits-02, Lectures-45)

I) **Amino Acids:** Common Structural features, Sterio-Isomerism, Classification and Structures of standard amino acids, amino acids as zwitterions, physical and chemical properties, titration of amino acids.

Peptides; Structure of peptide bond, Structure & functions of Oxytocin & Vasopressin. **(12 Lectures)**

II) **Proteins:** Introduction, Composition. Protein structure, Levels of Structure; Primary, Secondary-helix and pleated sheets, Tertiary-forces stabilizing tertiary structure and quaternary structure of protein.

Classification: Simple, conjugated & derived proteins, Physico-chemical properties-IpH, denaturation, salting out & salting in, hydrolysis & color reactions of proteins due to side-chain. Biological functions of proteins. **(12 Lectures)**

III) **Nucleic Acids:** Composition of DNA and RNA, occurrence & types of nucleic acids, generalized structural plan of nucleic acids, Chemistry of nucleotides features of DNA double helix. Denaturation of DNA, structure and roles of different types of RNA (m-RNA, t-RNA, r-RNA) DNA & RNA viruses. **(12 Lectures)**

IV) **Porphyrins:** Chemistry of nucleus: classification, important, metalloporphyrins (hemoglobin, cytochrome, chlorophyll),

Bile pigments: chemistry and their physiological role. **(09 Lectures)**

Reference Book:

1) Lehninger's Principles of Biochemistry (2000) by Nelson, David L. and Cox M.M Machnil Han/Worth N.Y.
2) Biochemistry 3rd (1994) By Lubert Stryer, WH Freeman and Co. San Francisco.
3) Outlines of Biochemistry by Eric E Corn. P.K. stumpff G.Bruening and Ray H Doi, John Wiley and Sons N.Y.
4) Biochemistry (revised 5th edition 2018) by U. Satyanarayan , U.Chakrapani.
5) Fundamental of Biochemistry by J.L Jain.

BC-121

Laboratory Course –I (Based on BC-111 & BC-112)

(Credits-1.5; 3 Hours per week)

(Lectures-04 per week)

1) Carbohydrates: Tests: Glucose, fructose, sucrose, starch, Identification of Unknown sugar.
2) Amino acids & Proteins- Albumin, Casein, etc.
3) Lipids : General tests and glycerol
4) Determination of saponification value
5) Iodine no. of fats.
6) Estimation of carbohydrates- Hanes method.

Reference Book:

1) An Introduction to PRACTICAL BIOCHEMISTRY (3rd Ed) by David T Plummer.
2) LABORATORY MANUAL IN BIOCHEMISTRY by J.JAYRAMAN.
3) Fundamental of Biochemistry by J.L Jain.

Semester-II

BC-211

ENZYMES

(Theory credits-02, Lectures-45)

I) Introduction: History general characteristics, nomenclature, IUB enzyme classification with example. Minimum 2 examples. Holoenzyme, apoenzymes, coenzymes, cofactor, activators, inhibitors, active site (identification of groups excluded) metalloenzymes, units of enzyme activity, specific enzymes. Isoenzymes, monomeric enzymes, oligomeric enzymes and multi-enzyme complexes **(12 Lectures)**

II) Enzyme specificity.Measurement and expression of enzyme activity-enzyme assays. Definition of IU, enzyme turn over number and specific activity. Coenzyme, prosthetic groups. Enzyme catalysis & Coenzymes: Role of cofactors in enzyme catalysis. NAD/NADP FMN/FAD, coenzyme A, biocytin, cobamide, lipoamide, TPP, pyridoxal phosphate, tetrahydrofolate and metal ions with special emphasis of coenzyme functions. **(13 Lectures)**

III) Enzyme Kinetics: Factors affecting enzyme activity: enzyme concentration, substrate concentration, pH and temperature. Derivation of Michaelis-Menten equation for uni-substrate reactions, km and its significance, Line weaver-Burk plot and its limitations. Importance of Kct/k. Bi-substrate reactions-brief introduction to sequential and ping=pong mechanisms with examples. Kintics of Zero and first order reactions. **(10 Lectures)**

IV) Significance and evaluation of energy of activation and free energy.

Reversible and irreversible inhibition, competitive, non-competitive and uncompetitive ihibilitions, determination of km and Vmax in presence and absence of inhibitor. Allosteric enzymes. **(10 Lectures)**

Reference Book:

1) Biochemistry 3rd (1994) By Lubert Stryer, WH Freeman and Co. San Francisco.
2) Enzymes (3rd Ed) Dixon M and Webb. E.C. Longmans London.
3) Enzymes structure and function by S. Blackburn Marcel Dekker, Inc N.Y.
4) ENZYMES-Biochemistry, Biotechnology, Clinical Chemistry-By Trevor Palmer.
5) Biotechnology by J.E.Smith.
6) Fundamental of Biochemistry by J.L Jain.

BC-212

BIOCHEMICAL TECHNIQUES-I

(Theory credits-02, Lectures-45)

I) Acids, bases, buffers: (08 Lectures)

Concept of water as biological solvent, weak acids and bases, pH, buffers, Handersons-Hasselbaich equation.Measurments of pH by indicators (liquid & pH paper) pH meter.

II) Chromatography: (15 Lectures)

General Principles working and applications of

a) Adsorption chromatography
b) Iron exchange chromatography
c) Thin layer chromatography
d) Molecular sieve chromatography
e) Gas liquid chromatography
f) Affinity chromatography
g) Paper chromatography

III) Electrophoresis: (11 Lectures)

Principle, factors, Tiselius apparatus, Continuous and discontinuous, paper, gel, Immunoelectrophoresis, PAGE and SDS-PAGE, Two dimensional electrophoresis, its importance, Isoelectrofocussing.

IV) Spectroscopic Techniques: (11 Lectures)

Beer- Lambert law, light absorption and it transmittance, determination and application of extinction coefficient, application of visible and UV spectroscopic techniques, Fluorescent and emission spectroscopy techniques, Fluorescent and emission spectroscopy.

Reference book:

1) Outlines of Biochemistry by Eric E Corn. P.K. stumpff G. Bruening and Ray H Doi, John Wiley and Sons N.Y.
2) Biophysical chemistry Principal and Techniques by Upadhay and Nath.
3) Principle and techniques of Practical Biochemistry William and Golding and /or William and Walker.

BC-221

Laboratory course

(Credits-1.5; 3 hour per week)

(Lectures 04 per week)

1) Determination of pH of solutions
2) Titration curve for amino acids and determination of pK value
3) Estimation of Ascorbic acid
4) Estimation of amino acids by Sorenson-formal titration
5) Verification of Lambert Beer's law and its limitations
6) Extraction of lipids by Folch method
7) Tests of food adultrants.

Reference book:

1) Principle and techniques of Practical Biochemistry William and Golding and /or William and Walker.
2) An Introduction to Practical Biochemistry (3rd Ed) by David T Plummer.
3) Laboratory Manual In Biochemistry by J.JAYRAMAN
4) Fundamental of Biochemistry by J.L Jain.