



CIRCULAR NO.SU/B.Sc./CBC&GS /69/2023

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, the Hon'ble Vice-Chancellor has accepted the **following syllabi of Bachelor of Science with Practical Pattern of Question Paper 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. Biotechnology (Optional)	IIIrd & IVth semester
2.	B.Sc. Microbiology (Optional)	IIIrd & IVth semester
3.	B.Sc. Information Technology (Optional)	IIIrd & IVth semester
4.	Bachelor of Computer Application (Optional)	IIIrd & IVth semester
5.	B.Sc.Polymer Chemistry (Optional)	IIIrd & IVth semester
6.	B.Sc.Computer Science (Degree)	IIIrd & IVth semester
7.	Honors Degree of Computer Science	IIIrd & IVth semester
8.	Honors Degree of Biotechnology	IIIrd & IVth semester

This is effective from the Academic Year 2023-24 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/2023/ 1241-49

Date:- 12.06.2023.

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*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 - 431004 (MS) India.



Undergraduate Bachelor Degree Program
in

B.Sc. Biotechnology
(Honours)

Course Structure and Curriculum

(Outcome based Curriculum)

Choice Based Credit System

(Effective from Academic Year 2022-23)

Run at Model Degree College, Ghansawangi. Dist: Jalna

Dr. Babasaheb Ambedkar Marathwada University

Aurangabad – 431004 (MS) India

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Ad-Hoc Board of Studies Biotechnology
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad

2. Course Structure

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Choice Based Credit System (CBCS) Curriculum

For

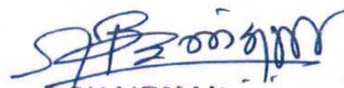
Faculty of Science and Technology

Course Structure and Scheme of Examination

B.Sc. Biotechnology (Honors) Three Year Undergraduate Degree Program

Run at Model College Ghansawangi.

Semester I									
	Name of Course	Course Code	Course Title	(Teaching periods/week)	Credits	Scheme of Examination			
						Max Marks	CIA	UA	Min Marks
Ability Enhancement compulsory courses (AECC-1)	Language Curriculum	BTE-101	English-I	4Hours/week	4	100	40	60	40
		BTSL-102	Marathi/Hindi	4Hours/week	4	100	40	60	40
Core Courses	Core A	BTCA-103	Inheritance Biology	3Hours /week	3	50	20	30	20
	Core B	BTCB-104	Genomes and Inheritance	3Hours /week	3	50	20	30	20
	Supportive	BTS-105	Biomolecules I	3Hours /week	2	50	20	30	20
	Applied	BTA-106	Essentials of Microbiology	2Hours/week	2	50	20	30	20
	Practical based on Core A	BTCA-103P	Lab Course I	2Hours/week	2	50	0	50	20
	Practical based on Core B	BTCB-104P	Lab Course II	2Hours/week	2	50	0	50	20
	Practical based on Supportive	BTS-105P	Lab Course III	2Hours/week	2	50	0	50	20
	Practical based on Applied	BTA-106P	Lab Course IV	2Hours/week	2	50	0	50	20
Life Skill Curriculum	Job Oriented Soft Skills	BT-JOC-107	JOC(Job Oriented Course)	2Hours/week	2	50	20	30	20
	Value Oriented Courses	BT-VOC-108	VOC (Value Oriented course)	2Hours/week	2	50	20	30	20
				30	30	700	200	500	280
Total Credits for Semester I : 30 (Theory : 22 ; Laboratory : 8)									


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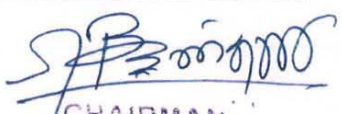
Semester II									
	Name of Course	Course Code	Course Title	(Teaching periods/week)	Credits	Scheme of Examination			
						Max Marks	CIA	UA	Min Marks
Ability Enhancement compulsory courses (AECC-1)	Language Curriculum	BTE-201	English-I	4Hours/week	4	100	40	60	40
		BTSL-202	Marathi/Hindi	4Hours/week	4	100	40	60	40
Core Courses	Core A	BTCA-203	Cell Biology	3Hours /week	3	50	20	30	20
	Core B	BTCB-204	Fundamentals of Genetics	3Hours /week	3	50	20	30	20
	Supportive	BTS-205	Microbial Physiology	3Hours /week	2	50	20	30	20
	Applied	BTA-206	Biomolecules-II	2Hours/week	2	50	20	30	20
	Practical based on Core A	BTCA-203P	Lab Course V	2Hours/week	2	50	0	50	20
	Practical based on Core B	BTCB-204P	Lab Course VI	2Hours/week	2	50	0	50	20
	Practical based on Supportive	BTS-205P	Lab Course VII	2Hours/week	2	50	0	50	20
	Practical based on Applied	BTA-206P	Lab Course VIII	2Hours/week	2	50	0	50	20
Life Skill Curriculum	Job Oriented Soft Skills	BT-JOC-207	JOC(Job Oriented Course)	2Hours/week	2	50	20	30	20
	Value Oriented Courses	BT-VOC-208	VOC (Value Oriented course)	2Hours/week	2	50	20	30	20
Non Credit Course			Constitution of India	3Hours/Week	2*	50	10	40	20
				30	30	700	200	500	280
Total Credits for Semester I : 30 (Theory : 22 ; Laboratory : 8)									


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Semester III									
	Name of Course	Course Code	Course Title	(Teaching periods/week)	Credits	Scheme of Examination			
						Max Marks	CIA	UA	Min Marks
Ability Enhancement compulsory courses (AECC-1)	Language Curriculum	BTE-301	Reading Literature in English-I	4Hours/week	4	100	40	60	40
		BTSL-302	Marathi/Hindi	4Hours/week	4	100	40	60	40
Optional I (DSE-1C)	Core A	BTCA-303	Central Dogma	3Hours /week	3	50	20	30	20
	Core B	BTCB-304	Introductory Physiology	3Hours /week	3	50	20	30	20
	Practical based on Core A	BTCA-303P	Lab Course-IX	2Hours/week	2	50	0	50	20
	Practical based on Core B	BTCB-304P	Lab Course-X	2Hours/week	2	50	0	50	20
Optional II (DSE-2C)	Supportive	BTS-305	Introductory Enzymology	3Hours /week	2	50	20	30	20
	Practical based on Supportive	BTS-305P	Lab Course-XI	2Hours/week	2	50	0	50	20
Optional III (DSE-3C)	Applied	BTA-306	Microbial Diversity, food and dairy microbiology	2Hours/week	2	50	20	30	20
	Practical based on Applied	BTA-306P	Lab Course XII	2Hours/week	2	50	0	50	20
	Applied								
Skill Enhancement Course (SEC-1)	Job Oriented Soft Skills	BT-JOC-307	JOC(Job Oriented Course)	2Hours/week	2	50	20	30	20
	Value Oriented Courses	BT-VOC-308	VOC (Value Oriented course)	2Hours/week	2	50	20	30	20
				30	30	700	200	500	280
Total Credits for Semester III : 30 (Theory : 22 ; Laboratory : 8)									


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Semester IV									
	Name of Course	Course Code	Course Title	(Teaching periods/week)	Credits	Scheme of Examination			
						Max	CIA	UA	Min Marks
						Marks			
Ability Enhancement compulsory courses (AECC-1)	Language Curriculum	BTE-401	Reading Literature in English-II	4Hours/week	4	100	40	60	40
		BTSL-402	Marathi/Hindi	4Hours/week	4	100	40	60	40
Optional I (DSE-ID)	Core A	BTCA-403	Gene Expression	3Hours/week	3	50	20	30	20
	Core B	BTCL-404	Developmental Biology	3Hours/week	3	50	20	30	20
	Practical based on Core A	BTCA-403P	Lab Course-XIII	2Hours/week	2	50	0	50	20
	Practical based on Core B	BTCL-404P	Lab Course-XIV	2Hours/week	2	50	0	50	20
Optional II (DSE-2D)	Supportive	BTS-405	Advance and applied enzymology	3Hours/week	2	50	20	30	20
	Practical based on Supportive	BTS-405P	Lab Course-XV	2Hours/week	2	50	0	50	20
Optional III (DSE-3D)	Applied	BTA-406	Environmental and agricultural microbiology	2Hours/week	2	50	20	30	20
	Practical based on Applied	BTA-406P	Lab Course-XVI	2Hours/week	2	50	0	50	20
Skill Enhancement Course (SEC-2)	Job Oriented Soft Skills	BT-JOC-407	JOC(Job Oriented Course)	2Hours/week	2	50	20	30	20
	Value Oriented Courses	BT-VOC-408	VOC (Value Oriented course)	2Hours/week	2	50	20	30	20
Non Credit Course			Environmental Studies	3Hours/Week	2*	50	10	40	20
				30	30	700	200	500	280
Total Credits for Semester IV : 30 (Theory : 22 ; Laboratory : 8)									


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B. Sc. Biotechnology (Honours) III Semester

BTCA-303: Central Dogma

Paper: Core A

Total Credit: 03

Contact Hours: 45 (Clock Hours)

Marks: 50

Unit 1. Replication

Replication in Prokaryotes –*Escherichia coli* replication as role model, DNA polymerases –with reference to their functional properties, formation of replication fork, primer formation, replication on leading and lagging strand, termination of replication. **Eukaryotic DNA replication:** Origin Recognition Complex, Licensing factor, components of replicase and other polymerases. Replication fork –experimental proof for multiple replication forks in eukaryotes. Process of replication, initiation, elongation and termination. Replication of Extra chromosomal material

Unit 2. Transcription

Transcription in *Escherichia coli* -a role model for prokaryotes –RNA polymerase: structural components and assembly of core and holoenzyme. **Transcription initiation** Bacterial transcription; RNA Polymerase, transcription initiation, transcription elongation, transcription termination and antitermination. **Eukaryotic transcription:** RNA polymerases, Transcription initiation; Transcription elongation; Transcription termination

Unit 3 Translation

Prokaryotic translation –translation initiation, ribosome assembly, RBS – Shine Dalgarno sequence, initiation codon, initiation complex, initiator tRNA, P site, A site and E site –their relevance in translation, translocation, **Translation elongation** structural different between initiator tRNA and methionine tRNA during elongation, transpeptidation and chain elongation. Translation fidelity. **Translation termination** factors and release of ribosomes and their recycling.

Eukaryotic translation: translation initiation ; Formation of initiation complex, P site, A site and E site, their role during mRNA translation. **Translation elongation**; comparative studies of elongation with *E. coli*.

Translation termination; factors, release of ribosomes and recycling, regulation.

References:

1. Molecular Biology –David Frifelder
2. Genes IX –Benjamin Lewin
3. Molecular biology of the gene J. D. Watson and *et. al.*,
4. Molecular Biology of the Cell –Bruce Alberts and *et. al.*,

Practical**Lab Course -IX****BTCA-303P: Practical Based on Central dogma**

1. Demonstration of Mitosis –onion root tips experiment
 2. Meiosis slide demonstration (permanent slides)
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3. Plasmid DNA isolation
 4. Plasmid Curing
 5. Isolation of total proteins from bacterial cell.
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BTCB-304: Introductory Physiology

Paper: Core B

Contact Hours: 45 (Clock Hours)

Total Credit: 03

Marks: 50

Unit 1. Elements of Animal Physiology

Definition of digestion, types of digestion – (extra and intracellular), general principles of digestion

Definition of excretion; Forms of nitrogenous waste material and their formation;

Types of respiration – external and internal respiration;

Transport of oxygen and CO₂

General structure and types of muscles, Ultra structure of skeletal muscle.

Structure of nerve cell; Nature and Properties of nerve impulse

Concept of Homeostasis and its basic working mechanism. (giving three illustrations viz., Hormonal control of glucose levels, Water and ionic regulation by freshwater and marine animals and temperature regulation in man.)

Unit 2. Photobiology of plants

Significance, site of photosynthesis, pigments, photochemical phase. Electron transport chain. Photophosphorylation, (cyclic and non cyclic). Biosynthetic phase, Calvin cycle, C₃ and C₄ pathways. Photorespiration, Crassulacean Acid Metabolism, factors affecting photosynthesis. function and mechanisms of action of phytochromes, cryptochromes and phototropins; photoperiodism and biological clocks. Brief account only.)

Unit 3. Elements of Plant Physiology

Plant Cell as a physiological unit. Osmosis, Imbibition. Diffusion, D.P.D. Water potential,

Absorption of water, (active & passive). Plasmolysis, cohesion, tension and transpiration pull theory.

Significance, factors affecting transpiration,

Phases of growth, growth curve. Plant growth regulators Auxins, Gibberellins, Cytokinins Ethylene, Abscic acid physiological functions only. Senescence brief account only.

Responses of plants to biotic (pathogen and insects) and abiotic (water, temperature and salt) stresses; mechanisms of resistance to biotic stress and tolerance to abiotic stress

Reference books

1. 'Essentials of Animal Physiology' by S.C.Rastogi
2. 'Animal Physiology' by H.C. Nigam.
3. 'Biology' by Campbell & Reece.
4. 'Animal Physiology' – Agarwal, R.A. Srivastava, Kaushal, Anil and Kumar.
5. 'Animal Physiology and Biochemistry' by Dr. B.Annadurai.
6. 'Principles of Animal Physiology' by Christopher D.Moyes, Patricia M Schulte.
7. 'Biology: The Science of Life' by R.A. Wallace, G.P. Sanders & R.J. Ferl.
8. 'Biology: Concepts and Applications' by Starr
9. Bilgrami K.S & Dube A text book On Modern Plant Pathology. Vikas Publishing House, New Delhi.

Practical Lab Course -X

BTCB-304P: Practical Based on : Introductory Physiology

1. Effect of P^H on amylase
2. Effect of Temperature on amylase
3. Estimation of Salivary Amylase
4. Estimation of urine constituents
5. Effect of stomata number on rate of transpiration. (Cobalt Chloride test)
6. Imbibition
7. Osmosis
8. Extraction of photosynthetic pigments (Paper Chromatography)

BTS-305: Introductory Enzymology

Paper: Supportive
Contact Hours: 30 (Clock Hours)

Total Credit: 02
Marks: 50

Unit 1 Introduction to enzymes

Introduction & Definition of Enzymes, Historical Development in Enzymology, Enzyme Vs Chemical Catalysts Coenzymes, Cofactors, Apoenzymes, Holoenzyme, Isoenzymes and multiple forms of enzymes, Characteristics of enzymes, Concept of active centre, binding sites, Enzyme mechanism & Activation Energy, Enzyme Specificity, Fischer and Koshland Models Classification - IUB system, rationale, overview and specific examples.
Characteristics of enzymes,

Unit 2 enzyme kinetics

ES complex formation Michaelis - Menten Equation - form and derivation, steady state enzyme kinetics. Significance of V_{max} and K_m , Graphical procedures in enzymology - advantages and disadvantages of alternate plotting.

Enzyme inhibition - types of inhibitors - competitive, noncompetitive and uncompetitive, their mode of action and experimental determination,

Unit 3: Enzyme isolation and purification

Introduction, Criteria for selection of tissue/ organism, Enzyme solubilization techniques, Techniques used for enzyme isolation, Methods of enzyme purification, Fractionation of the proteins on the basis of solubility in aqueous solutions of salts or organic solvents, Chromatographic separation of the enzymes (brief discussion on applications of Ion exchange chromatography Adsorption chromatography Gel filtration (Molecular sieve) chromatography

Affinity chromatography in enzyme separation)

Miscellaneous methods: Electrophoretic techniques, Ultrafiltration Dialysis Crystallization

Criteria of purity of the enzymes, Preparation of purification table, Characterization of enzymes Determination of molecular weight of the enzyme protein, Sodium dodecyl sulfate (SDS) polyacrylamide gel electrophoresis for subunit molecular weight determination,

References

1. Dixon & Webb –Enzymes; Academic press New York
2. A.L. Lehninger- Biochemistry
3. A.L. Lehninger, D. L. Nelson & M M Cox – Principles of Biochemistry.
4. Cohn & Stump – Outline of Biochemistry; Wiley Eastern Ltd.
5. LubertStryer – Biochemistry
6. R.L. Foster – The nature of Enzymology; Croom-Helm London
7. Harpers -Review of biochemistry –;Prentice HallNew york
8. R.A. Copeland -Enzymes: A Practical Introduction to Structure, Mechanism and Data Analysis,; John Wiley and Sons Inc.

Practical
Lab Course -XI
BTCB-305P: Practical Based on Introductory enzymology

1. Detection of enzyme production by bacteria & Fungi: Proteases, alpha, amylase, lipase, Cellulase.
 2. Detection of B-Lactamase Production by Saureus / E coli.
 3. Assay of urease.
 4. Assay of alpha Amylase in terms of substrate consumpron.
 5. Assay of alkaline phosphatane in human serum.
 6. Detection of extremozymes production by bacterial isolates from extreme environment e.g. : salted fish.
 7. Study of substrate specificity of enzymes.
 8. Effect of P^{II} on enzyme activity
 9. Effect of Temperature on enzyme activity
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BTA-306:Microbial diversity, food and dairy microbiology

Paper: Applied
Contact Hours: 30 (Clock Hours)

Total Credit: 02
Marks: 50

Unit I :Algae, Fungi and Protozoa, eubacteria, Gram positive aerobic, Gram positive anaerobic, Gram negative facultative anaerobic, Gram negative anaerobic.

Units II –Dairy Microbiology; milk definition, sources of contamination, Microbial count, pasteurization, milk products.

Unit III –Food preservations, radiation, low temperature, high temeperature, chemicals, antimicrobials, FDS, ISI, and EPA.

Reference

1. Brocks Biology of Microorganisms. 8th Edition by Michael T. Madigan, John M. Martinko. Jack Parker.
2. Microbiology by Pelczar.
3. Microbial Diversity by Colwd, D. 1999, Academic Press.
4. Microbiology: Dynamics and Diversity by Perry.
5. Microbial Ecology. Fundamentals and Applications by Ronald M. Atlas and Richard
6. Food Microbiology. 2nd Edition By Adams
7. Basic Food Microbiology by Banwart George J.
8. Food Microbiology: Fundamentals and Frontiers by Dolle
9. Dairy Microbiology by Robinson.
10. Applied dairy Microbiology, by Elmer H. Marth , James L. Steele
11. Text book of modern pathology by Dube H.C. and Bilgrami. K.S.(1976) Vikas publishing house. New Delhi

**Practical
Lab Course -XII**

**BTCB-306P: Practical Based on Microbial diversity, food and dairy
microbiology**

1 Isolation of *Staphylococcus aureus* from spoiled food samples.

2 Isolation of *Salmonella typhi* from spoiled food samples.

3 Standard plate count of milk.

4 Determination of quality of milk by MBRT test.

5 Phosphatase test for Pasteurised milk sample

6. Isolation of Fungi from soil and water samples.

7.. Isolation of Actinomycetes from soil and water samples.

8. Isolation of bacteria from soil and water samples

9. Study of algae and protozoa.

10. Isolation of thermophiles from soil.

11. Isolation of Acidophiles from soil.

B. Sc. Biotechnology (Honours) IV Semester

BTCA-403: Gene Expression

Paper: Core A
Contact Hours: 45 (Clock Hours)

Total Credit: 03
Marks: 50

Unit 1: Basics of Gene Expression

Regulatory elements/factors: (Inculcate concepts with suitable examples for; Cis-acting elements, Trans-acting factors. Exceptional proteins behaving Cis-acting). Regulation of transposition of Tn3 and Tn9. Modifications of Cis-acting elements to influence and to affect regulation. Influencing or affecting gene expression as a presence/or absence of functional form of protein factor. Concept of Activator, Co-activator, Repressor (with suitable examples). Examples with mechanisms; specific regulator and global regulator.

DNA-protein interactions, RNA-protein interactions– conditions favoring and affecting these interactions (to be dealt with ref to Motifs).

Unit 2: Bacterial Gene Expression and regulation

Concept of Operon, Regulation of gene expression; **positive control**–the *ara* operon, **negative control**–paradigm the *lac* operon and **attenuation mediated control** or post-transcriptional regulatory control–the *trp* operon. (Must include structural organization of above operons, functional relevance of genes within, regulatory circuit, modes by which the operon can be regulated other than above mentioned mode.) Concept of Catabolite Repression. Examples of non-catabolite sugars and their regulation, catabolite repression in amino acid metabolism– examples at molecular level.

Unit 3 Eukaryotic Gene Expression and regulation

Activators:–gene specific and generalized type of activator. Domains of activators, protein and DNA/or RNA binding domain. Modification of activator. Enhancer mediated gene expression – examples. Gene expression of metallothionein gene expression. Response elements such as; steroid hormone response elements, metal response elements, Basal Expression response elements. Regulation of gene expression at a step of activation of basal apparatus, Postinitiation gene expression– mechanism of relieving roadblock (stuttering of RNA polymerase) with example. Regulation of mRNA molecules involving both nonstop and nonsense mechanisms. Gene regulation with example–posttranscriptional–yeast and *Drosophila* genes, insulators in genomic imprinting–concept and example.

References

1. Biochemistry–Lehninger
2. Principles of Biochemistry–Nelson and Cox
3. Microbial genetics–David Frifelder
4. Molecular Biology–David Frifelder
5. Genes –IX
6. Genes –X
7. Principles of gene manipulations–Old and Primrose
8. Biochemistry–Jeremy M. Berg, John L. Tymoczko, and Lubert Stryer
9. Principles of Gene Manipulations LPE Pearson- Watson
10. Genetics–Strickberger

Practical Lab Course -XIII

BTCA-403P: Practical Based on Gene Expression

- 1 Isolation of Lactose negative mutants
- 2 Study of catabolite repression with the example of *gal* operon
- 3 Study of non-catabolite repression.
- 4 Study of impact of catabolite repression on amino acid metabolism
- 5 Yeast α -galactosidase assay.
- 6 Two-hybrid system demonstration (demonstration thru kit–could be asked in examination).
- 7 Isolation of Tryptophan negative mutant and theoretical mapping.
- 8 Isolation of Arabinose negative mutant and theoretical mapping.
- 9 Study of the β -galactosidase assay of the *lacY* and *lacZ* mutants.
- 10 Study of mutants isolated with mutagen with reference to differential- galactosidase activity.

BTCE-404: Developmental Biology

Paper: Core B
Contact Hours: 45 (Clock Hours)

Total Credit: 03
Marks: 50

Unit 1 :Developmental Biology an overview

Introduction of animal development:Development among unicellular eukaryotes–*Acetabularis*,*Naegleria*.The origins of sexual reproduction. Fertilization: structure of gametes, recognition of sperm and egg–action at distance and contact of gametes.Cleavage: Patterns of embryonic cleavage, radial holoblastic cleavage, spiral holoblastic cleavage, mechanisms of cleavage–regulation of cleavage cycles.

Unit 2 :Early Embryonic Development ,Cell death and regeneration

Gametogenesis,Fertilization,Embryo sac development and double fertilization in plants, blastula formation, Types of Cleavage, Gastrulation and formation of germ layers in animals. Study of extra-embryonic membrane in chick, concept of regeneration programmed cell death and aging and senescence

Unit3 :Morphogenesis and organogenesis in animals

Cell aggregation and differential in *Dictyostelium*; axes and pattern formation in *Drosophila*, organogenesis–vulva formation in *Caenorhabditiselegans*; eye lens induction, limb development in vertebrates, neuron differentiation, -larval formation, metamorphosis; environmental regulation of normal development.

References

1. Developmental Biology by Scott Gilbert-9th edition
2. Balinsky–An introduction to embryology CBS college Publishers
3. Lodish H, *et.al.*, Molecular Cell Biology
4. Alberts Bruce, *et.al.*, Molecular Biology of the Cell Sinauer
5. Grant–Biology of Development systems, Holt. Reihart, Winston.
6. Developmental Biology website companion to Gilbert-
<http://www.devbio.com/contents.php>

Practical
Lab Course -XIV
BTCB-404P: Practical Based on Developmental Biology

1. Study of meiosis in Grasshopper testis/ onion buds
 2. Study of development of frog embryo from permanent slides (at least five)
 3. Study of different types of cancer cell
 4. Study of Pores of Chick Egg Shell
 5. Study of Chick Egg Shell Membrane
 6. Observation of Egg Chalazae
 7. Antimicrobial Activity of Chick Egg
 8. Observation of Blastodisc
 9. Study of Totipotency in Plants
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BTS-405-Advanced and Applied Enzymology

Paper: Supportive
Contact Hours: 30 (Clock Hours)

Total Credit: 02
Marks: 50

Unit 1: Regulatory Enzymes & Structure Function Relations:

Allosteric enzymes with their properties, Regulatory role of allosteric enzymes in metabolism, Mechanism of ALLOSTERIC INTERACTIONS: Protein ligand binding including measurements, analysis of binding isotherms, co-operativity Hill and Scatchard plots and kinetics of allosteric enzymes

Modes of enzyme regulation: Allosteric regulation Product inhibition, feedback control, enzyme induction and repression and covalent modification.

Specific examples of enzymes with respect to Structure Function Relations

Lysozyme, ribonuclease, trypsin, carboxypeptidase, phosphorylase, aspartate transcarbamylase, : PFK-1, Fructose 1, 6 Bisphosphatase, glutamine synthetase and phosphofructo kinase. Multi enzyme complexes - pyruvate dehydrogenase and fatty acid synthetase; Na - K ATPase.

Unit 2: Immobilized Enzymes:

Relative practical and economic advantage for industrial use, effect of partition on kinetics and performance with particular emphasis on charge and hydrophobicity (pH, temperature and K_m). Various methods of immobilization - ionic bonding, adsorption, covalent bonding (based on R groups of amino acids) , microencapsulation and gel entrapment. Immobilized multienzyme systems

Biosensors - glucose oxidase, cholesterol oxidase, urease and antibodies as biosensors

Unit 3: Enzyme Disorders In Humans

Enzyme involved, diagnostics, physiological effects, physical impact (if any), treatment and cure, prevention of manifestation of following disorders Tay-Sachs Disease, Gaucher's Disease, Galactosemia, Methylmalonic Acidemia, Propionic Acidemia, Alkaptonuria, Phenylketonuria G6PD Deficiency, Congenital Adrenal Hyperplasia, Pyruvate Kinase Deficiency.

References

1. Dixon & Webb –Enzymes; Academic press New York
2. A.L. Lehninger- Biochemistry
3. A.L. Lehninger, D. L. Nelson & M M Cox – Principles of Biochemistry.
4. Cohn & Stump – Outline of Biochemistry; Wiley Eastern Ltd.
5. LubertStryer – Biochemistry
6. R.L. Foster – The nature of Enzymology; Croom-Helm London
7. Harpers -Review of biochemistry –;Prentice Hall New york
8. R.A. Copeland -Enzymes: A Practical Introduction to Structure, Mechanism and Data Analysis;; John Wiley and Sons Inc.
9. Zuby,Parson, and Vanse –principles of Biochemistry; Wm.C. Brown Publishers

Practical Lab Course -XV

BTS-405P: Practical Based onAdvanced and Applied Enzymology

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1. Production of bacterial / fungal – alpha amylase.
 2. Partial purification of – amylase by salt precipitation method.
 3. Assay of alpha amylase in terms of reducing sugar produced & calculation of Enzyme unit.
 4. Extraction of unease from horse gram seed / jack bean meal & estimation of its

Activity in terms Ammonia.

5. Extraction of papain form papaya leaves. Estimation of its activity in terms of Ammonia.
6. Characterization of alpha Amylase, invertase using PAGE.
7. extraction urease and its assay

B. Sc. Biotechnology (Honours) III Semester

BTCA-303:Central Dogma

Paper: Core A

Total Credit: 03

Contact Hours: 45 (Clock Hours)

Marks: 50

Unit 1. Replication

Replication in Prokaryotes –*Escherichia coli* replication as role model, DNA polymerases – with reference to their functional properties, formation of replication fork, primer formation, replication on leading and lagging strand, termination of replication. **Eukaryotic DNA replication:** Origin Recognition Complex, Licensing factor, components of replicase and other polymerases. Replication fork –experimental proof for multiple replication forks in eukaryotes. Process of replication, initiation, elongation and termination. Replication of Extra chromosomal material

Unit 2. Transcription

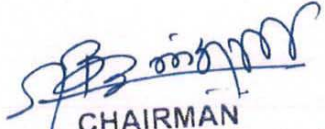
Transcription in *Escherichia coli* -a role model for prokaryotes –RNA polymerase: structural components and assembly of core and holoenzyme. **Transcription initiation** Bacterial transcription; RNA Polymerase, transcription initiation, transcription elongation, transcription termination and antitermination. **Eukaryotic transcription:** RNA polymerases, Transcription initiation; Transcription elongation; Transcription termination

Unit 3 Translation

Prokaryotic translation –translation initiation, ribosome assembly, RBS – Shine Dalgarno sequence, initiation codon, initiation complex, initiator tRNA, P site, A site and E site –their relevance in translation, translocation, **Translation elongation** structural different between initiator tRNA and methionine tRNA during elongation, transpeptidation and chain elongation. Translation fidelity. **Translation termination** factors and release of ribosomes and their recycling.

Eukaryotic translation: translation initiation ;Formation of initiation complex, P site, A site and E site, their role during mRNA translation. **Translation elongation**; comparative studies of elongation with *E. coli*.

Translation termination; factors, release of ribosomes and recycling, regulation.


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University, Aurangabad

**Practical
Lab Course -XVI
BTA-406P: Practical Based on Environmental and Agricultural
Microbiology**

1. Isolation of Rhizospheric micro organism.
2. Isolation of Rhizobium from root nodules.
3. Isolation of Azotobacter from soil.
4. Production of Azotobacter biofertilizer


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