

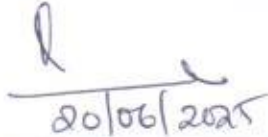


PROCEEDINGS OF THE BOS UG MEETING

The UG Board of Studies in Biochemistry. Meeting was held on **20-06-2025** (Online and Offline) at 11.00 am in the Dept. of Biochemistry, Kuvempu University, Shakaraghatta, Shimoga.

Members.

1	Dr. P. Niranjana Professor & Chairman (BOS UG), Dept. of Biochemistry, Kuvempu University, Shankaraghatta, Shimoga.	
2	Dr. Varunakumara. J.B Assistant Professor, Dept. of Biochemistry Sahyadri Science College, Shimoga.	
3	Dr. Nagesh Babu R. Professor, Dept. of Biochemistry Maharani Cluster University, Palace Road, Bangalore - 560 001.	 20/06/2025
4	Dr. Savitha K.R., Associate Professor, Dept. of Biochemistry University College of Science, Tumkur University, Tumkur.	Online
5	Dr. Premalatha S. J. Associate Professor Department of Biochemistry, Government Science College, Chitradurga - 577501.	Online

The Chairman, Dr. P. Niranjana, welcomed the members of UG Board of Studies in Biochemistry. The following issues were discussed in the meeting.

1. 3rd and 4th semester B.Sc., Biochemistry syllabus was thoroughly scrutinized as per the curriculum framework of (SEP 2024) specified both core and discipline specific elective papers.
2. The panel of examiners for 2025-26 was updated and approved the same

The meeting was concluded with the vote of thanks proposed by the Chairman.


 Chairman (BOS UG)
Chairman (BOS)
 Department of Biochemistry
 Kuvempu University
 Jnana Sahyadri
 SHANKARAGHATTA-577 451
 Karnataka



KUVEMPU UNIVERSITY

Jnanasahyadri, Shankaraghatta – 577451

SEP SYLLABUS FOR B.Sc., COURSE IN BIOCHEMISTRY SEMESTER III

ANALYTICAL BIOCHEMISTRY AND BIostatISTICS

COURSE TITLE	ANALYTICAL BIOCHEMISTRY AND BIostatISTICS
COURSE CREDITS	03
TOTAL CONTACT HOURS	48
DURATION OF ESA	03
FORMATIVE ASSESSMENT MARKS	20
SUMMATIVE ASSESSMENT MARKS	80

Course outcome:

- Students will acquire knowledge about the principles and applications of separation and purification techniques like centrifugation and chromatography used in a biochemistry laboratory.
- Students will learn about the principles and applications of electrophoresis and spectroscopic techniques involved in estimation and identification of biomolecules.
- It will also give them an opportunity to get hands-on experience to develop their experimental skills which are required for biological research lab.
- The students will understand the principles of collection of data in biological experiments, statistical analysis and importance of mean, standard error, standard deviation, significance in presenting the data

UNIT-1

12 hours

Centrifugation: Introduction, principle, sedimentation, sedimentation coefficient, angular velocity, centrifugal field, relative centrifugal field. Types – Preparative, analytical, differential, density gradient and ultra-centrifugation. Basic instrumentation: types of rotors and their design. Laboratory centrifuge; operational instruction and applications. Analytical Centrifuges- optics; application in sub-cellular fractionation. Care and maintenance of instruments.

Radioisotopic methods: Radioactivity – Types of radioactive decay, Properties of α , β , γ radiations. Group displacement law. Decay law - decay constant, half-life period and average life of a radioactive element. Detection of radioactivity – GM counter and scintillation counters (only principle and working). Applications of radioisotopes – ^3H , ^{14}C , ^{131}I , ^{60}Co and ^{32}P . Biological effects of radiations. Radiolabeling, safety measures in handling radioisotopes

UNIT-2

12 hours

Spectroscopy: Dual nature of light, electromagnetic spectrum, electronic transition in spectroscopy. Beer-lambert law and its limitations, principle, design and application of UV-Vis spectrophotometer, determination of molar absorption coefficient of molecules. Working principle and application of a colorimeter, flame photometer, fluorimeter, nephelometry and turbidometry. Principle and application of IR, Mass and NMR spectroscopy.

Unit-3

12 hours

Chromatography: General principles of chromatography – adsorption and partition. Techniques: Paper chromatography – Ascending, descending and circular, 2D–chromatography. Rf values. Column chromatography - principle of gel filtration, ion – exchange chromatography, affinity chromatography, HPLC, GLC. Thin layer chromatography (TLC) – Principle, procedure and applications.

Unit-4

12 hours

Electrophoresis: Supporting media - paper, agarose and polyacrylamide. Chemistry of polymerization of acrylamide gels, methodology and applications of native PAGE and SDS- PAGE, 2-D electrophoresis, Identification of proteins - dyes and biological activities. Principle and application of agarose gel and pulse field electrophoresis, capillary electrophoresis, isoelectric focusing and immune electrophoresis

Biostatistics: Aims, scope, definition and elementary idea of statistics in biology. Computation, classification, tabulation and diagrammatic presentation of statistical data. Basics of measures of central tendencies- mean, median, mode - measures of variations, standard deviation (SD), standard error mean (SEM). Basics of correlation and regression and its applications in biology.

REFERENCES:

1. Analytical techniques in Biochemistry and Molecular Biology; Katoch, Rajan. Springer 2011
2. Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology 8th Edn. Andreas Hoffman and Samuel Clockie, Ed., Cambridge University Press, 2018.
3. Biochemistry and Molecular Biology; 5th Edn. D. Papachristodoulou, A. Snape, W.H. Elliott, and D. C. Elliott, Oxford University Press 2014
4. Biophysical chemistry principle and techniques by Upadhyay and Upadhyay, Himalaya Publishing House
5. Bioinstrumentation by L Veerakumari, MJP Publishers, Chennai.
6. Biophysical Chemistry, Principles & Techniques – Upadhyay, Upadhyay and Nath – Himalaya Publ. House
7. Biochemistry laboratory: Modern theory and techniques, Rodney Boyer, Pearson Prentice Hall
8. Current Protocols in Protein Science, John E. Coligan John Wiley and Sons, Inc
9. Choosing and Using Statistics; A Biologist Guide, Clavin Dythan, Blackwell Scientific (1999)
10. Biostatistics: A Foundation for Analysis in the Health Sciences (2009) 9th ed., Daniel W.W., John Wiley and Sons Inc
11. Principles of Biostatistics, M. Pagano and K. Gauvreau; Duxbury Thomas learnings
12. Analysis of Biological Data, M. Whitlock and D. Schluter; Roberts and company publishers
13. Principles of Biostatistics, M. Pagano and K. Gauvreau; Duxbury Thomas learnings.
14. Analysis of Biological Data, M. Whitlock and D. Schluter; Roberts and company publishers

PRACTICALS III

COURSE TITLE	ANALYTICAL BIOCHEMISTRY AND BIostatISTICS
COURSE CREDITS	02
TOTAL CONTACT HOURS	4 Hours/ Week
DURATION OF ESA	03
FORMATIVE ASSESSMENT MARKS	10
SUMMATIVE ASSESSMENT MARKS	40

Course outcome:

- The student will obtain hands-on training in basic separation techniques in biochemistry and gain expertise in the isolation of various biomolecules
 - The students will develop skills in handling instruments and understand its application in research work and organelles.
- 1) Preparation of human lymphocytes using centrifuge
 - 2) Determination of packed cell volume/ hematocrit
 - 3) Separation of basic, acidic and aromatic amino acids by ascending and circular paper chromatography.
 - 4) Separation of plant pigments by gel-permeation/column chromatography
 - 5) Identification and resolution of pigments by thin layer chromatography.
 - 6) Determination of void volume of a gel-filtration column
 - 7) Absorption spectrum of riboflavin
 - 8) Colorimetric estimation of glucose by DNS method
 - 9) Estimation of DNA by diphenylamine method
 - 10) Electrophoretic separation of plasma proteins
 - 11) Estimation of protein by Biuret / Lowry's method
 - 12) Electrophoretic separation of plasma proteins using polyacrylamide gel electrophoresis.
 - 13) Verification of Beer-lamberts Law, determination of extinction coefficient.

REFERENCES:

1. Analytical techniques in Biochemistry and Molecular Biology; Katoch, Rajan. Springer, 2011
2. Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology 8thEdn. Andreas Hoffman and Samuel Clockie, Ed., Cambridge University Press, 2018.
3. Biochemistry and Molecular Biology; 5thEdn. D. Papachristodoulou, A. Snape, W.H. Elliott, and D. C. Elliott, Oxford University Press, 2014
4. Biophysical chemistry principle and techniques by Upadhyay and Upadhyay, Himalaya Publishing House
5. Bioinstrumentation by L Veerakumari, MJP Publishers, Chennai.



KUVEMPU UNIVERSITY

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SEP SYLLABUS FOR B.Sc., COURSE IN BIOCHEMISTRY SEMESTER IV

HUMAN PHYSIOLOGY AND ENZYMOLOGY

COURSE TITLE	HUMAN PHYSIOLOGY AND ENZYMOLOGY
COURSE CREDITS	03
TOTAL CONTACT HOURS	48
DURATION OF ESA	03
FORMATIVE ASSESSMENT MARKS	20
SUMMATIVE ASSESSMENT MARKS	80

Course Outcome:

- Students will gain insights into the human physiology like mechanism of signal transduction, the role of second messengers, gaseous exchange in tissues and lungs, Role of kidney normal constituents of urine, blood and their significance. The mechanisms of causation of diseases of liver, kidney and of cancer will be explained.
- Students will understand the concepts of enzyme kinetics, Enzyme activity, Enzyme Units, Specific activity. Allosteric and isoenzymes. They will study Industrial applications, enzyme inhibitions and regulatory process,

Unit-1

12hours

Nervous System: Brief outline of nervous system, Neurons – types, structure of multipolar neuron, mechanism of nerve impulse transmission- along axon, across synapse. Action potential & resting potential. Neurotransmitters – Excitatory & Inhibitory with examples.

Respiratory system: structure and functions of lungs, mechanism of respiration (pulmonary ventilation), gas exchange mechanism, biochemical events in the transport of gases & factors affecting, role of lungs in acid-base balance.

Cardio-vascular system: Structure and functions of heart. Blood vessels–types, Overview & functions: Cardiac cycle, cardiac output, regulation of CVS, blood pressure, heart rate, ECG. Body fluids – blood (composition, structure & functions of blood cells), blood clotting mechanism, Lymph and CSF.

Muscular System: Types of muscles and their structure. Ultra structure of skeletal muscle. Sliding filament model of skeletal muscle contraction.

Unit-2

12hours

Bone and Cartilage: Structure and types of bone and cartilage. Long bone – Composition, structure, growth & remodeling, factors affecting.

Digestive System and GIT: Anatomy of GIT and accessory organs, Digestion, absorption & transport of carbohydrates, lipids and proteins. Role of various enzymes involved in digestive process.

Hepatic System: Structure of a liver lobule. Role of liver in metabolic, storage and detoxification.

Excretory System: Brief outline of excretory system, formation of urine – Glomerular filtration, tubular reabsorption & secretions. Role of kidney in acid-base balance. Regulation of kidney function.

Endocrine System: Brief outline of various endocrine glands and their secretions. Dynamic balance and regulation of hormonal secretions. Classification of hormones based on structure and site of production. Physiological role of hormones of hypothalamus, pituitary, adrenal, thyroid, pancreas and gonads. Regulation of their secretion.

Unit-3

12hours

Introduction to enzymes: Nature of enzymes - protein and non-protein (ribozyme). Cofactor and prosthetic group, apoenzyme, holoenzyme, IUBMB classification of enzymes with examples. International Units of enzyme activity, specific activity. Monomeric and oligomeric enzymes- Monomeric enzymes, multifunctional enzymes, oligomeric enzymes and multi- enzyme complexes, isoenzymes- lactate dehydrogenase

Features of enzyme catalysis: Activation energy and transition state theory, catalytic power and specificity of enzymes (concept of active site), Theories of enzyme catalysis- Fischer's lock and key hypothesis, Koshland's induced fit hypothesis.

Unit -4

12hours

Enzyme kinetics of single substrate reactions:

Derivation of Michaelis-Menten equation, equilibrium constant – mono substrate reactions, relationship between initial velocity and substrate concentration, Factors affecting the rate of chemical reactions - enzyme concentration, substrate concentration- pH, temperature and metal ions. Lineweaver - Burk plot. Determination of V_{max} & K_m from L-B plot and their significance, K_{cat} and turnover number.

Reversible inhibition- competitive, uncompetitive, non-competitive with graphical representations using L-B plots, Evaluation of K_m and V_{max} in presence of inhibitor mixed and substrate. Irreversible inhibition- Suicide inhibition - antibiotics as inhibitors- penicillin.

REFERENCES:

1. Chatterjee C C, Human physiology, Medical allied Agency. New Delhi 2020
2. Gerard J Tortora, Bryan H D Errickson. Principles of anatomy and physiology, 13th edition, John Wiley & Sons 2000
3. Gyton and Hall, Textbook of medical physiology, 10th edition, Elsevier Health Sciences 2015
4. Sembulingam K & Prema Sembulingam, Essentials of medical physiology, 3rd edition, Jaypee Brothers, 2019
5. Thomas D. Pollard, William C. Earnshaw, Jennifer Lippincott - Schwartz and Graham T. Johnson, Cell Biology, 3rd edition, Elsevier 2017.
6. Lodish, Berk, Kaiser, Krieger et al., Molecular Cell Biology, 6th edition, 2010
7. Bruce Alberts, Hopkin, Johnson Morgan, Raff, Roberts, and Walter, Essential Cell Biology, 5th edition, W.W. Norton & Company, 2019
8. Cox, Michael M. Lehninger principles of biochemistry. Freeman, 2013.
9. Lubert Stryer. Biochemistry, 5th edition, 2006
10. Palmer, Understanding enzymes, 4th edition, Prentice Hall / Ellis Horward, London 2000

11. Price, Nicholas C., and Lewis Stevens. Fundamentals of Enzymology. Oxford Science Publications. Second edition. New York, 2010
12. Buchholz, Klaus, Volker Kasche, and Uwe Theo Bornscheuer. Biocatalysts and enzyme technology. John Wiley & Sons, 2012.
13. Voet, Donald, Judith G. Voet, and Charlotte W. Pratt. "Fundamentals of Biochemistry." New York: John Wiley & Sons 2008.
14. Devlin, Thomas M. Textbook of biochemistry: with clinical correlations. John Wiley & Sons, 2011.

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PRACTICALS IV

COURSE TITLE	HUMAN PHYSIOLOGY AND ENZYMOLOGY
COURSE CREDITS	02
TOTAL CONTACT HOURS	4 Hours/ Week
DURATION OF ESA	03
FORMATIVE ASSESSMENT MARKS	10
SUMMATIVE ASSESSMENT MARKS	40

Course Outcome:

- The learning outcomes include: estimation of enzyme activity, determination of pH optimum, Km and Vmax of enzymes and analysis of enzyme kinetics.
- Students will develop skills to isolate lymphocytes from blood/spleen.
- Students will also learn techniques the principles of blood typing.

EXPERIMENTS:

- 1) RBC and WBC count using Haemocytometer.
- 2) Separation of Serum and Plasma from Blood
- 3) Estimation of hemoglobin content in blood
- 4) Demonstration of biosafety and sterilization techniques.
- 5) Determination of blood pressure.
- 6) Estimation of amino acid by Sorenson's formal titration
- 7) Estimation of ascorbic acid in biological sample by indophenol method
- 8) Estimation of oxalate content in biological sample.
- 9) Estimation of Pi in biological sample by Fiske Subbarao method.
- 10) Isolation of Urease and demonstration of its activity.
- 11) Salivary amylase/ β -amylase
- 12) Construction of Maltose/glucose calibration curve by DNS method and determination of activity of amylase
- 13) Determination of specific activity of amylase
- 14) Determination of pH optimum of amylase.
- 15) Determination of Km and Vmax of amylase.
- 16) Determination of initial velocity [time kinetics] of amylase.
- 17) Determination of optimum temperature of amylase.

REFERENCES:

1. Practical Biochemistry, Geetha Damodaran, Jaypee, 2011
2. Biochemical methods, S. Sadasivam, A. Manickam, 3rd Edition, New Age International Pvt Ltd, 2007
3. An Introduction to Practical Biochemistry, David Plummer, 3rd edition 2017
4. Laboratory manual in Biochemistry, J. Jayaraman 2011
5. Textbook of Medical Physiology- C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A, 12th edition 2011
6. Textbook of Practical Physiology, C.L. Ghai, Jaypee brother's medical publishers, New Delhi, 10th edition 2022

7. Essentials of Medical Physiology, K. Sembulingam and P. Sembulingam. Jaypee brothers' medical publishers, New Delhi., 2019
8. An introduction to Practical Biochemistry, David Plummer, 3rd edition 2017
9. Laboratory manual in Biochemistry, Jayaraman J, New Age International publications, 2011
10. Practical Manual of Biochemistry, Sattanathan G., Swaminathan P. and Balasubramanian B. Sky fox press, 2020
11. Practical manual of Biochemistry, S. P Singh, 7thedition, CBS publications, 2013.
12. Sawhney, S.K., and Randhir Singh. Introductory practical biochemistry. Alpha Science Int'l Ltd., 2000.

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SEP SYLLABUS FOR B.Sc., COURSE IN BIOCHEMISTRY

SEMESTER III

(ELECTIVE-1)

NUTRITIONAL BIOCHEMISTRY

COURSE TITLE	NUTRITIONAL BIOCHEMISTRY
COURSE CREDITS	02
TOTAL CONTACT HOURS	32
DURATION OF ESA	02
FORMATIVE ASSESSMENT MARKS	10
SUMMATIVE ASSESSMENT MARKS	40

Course Outcome:

- They will learn concepts of nutrition, glycemic index, balanced diet, importance of micronutrient, deficiencies and the remedies, natural toxicants, adulterants and their hazards.
- Understand the various factors affecting the basal metabolism and their physiological functions.
- Understand the beneficial effects of food components in the preventing and managing diseases

Unit-1

8hours

Introduction: Basic principle of balanced diet. Energy source and nutrition, nutrimental requirements, food as a source of nutrients. Proximate analysis of foods (in brief).

Macronutrients: Introduction, their role as fuel molecules, sources, requirements, storage forms. Protein sparing effects of carbohydrates. Dietary fibers and their importance. Nitrogen balance. Complete and incomplete proteins, nutritive value of proteins. Mutual supplementation of proteins. Protein energy malnutrition.

Unit-2

8hours

Micronutrients:

Vitamins: Introduction, structure, rich sources daily requirements (of infants, adults, pregnant and lactating women only). Functions and deficiency vitamins. Fat soluble vitamins: A,D,E,K. water soluble vitamins: C and B complex- Vitamin B1(thiamine), riboflavin, niacin, pyridoxine, pantothenic acid, lipoic acid, biotin, folic acid and vitamin B12.

Minerals: Introduction, source (rich sources), daily requirements (for infants, adults, pregnant and lactating women only), functions and deficiency diseases of following minerals. Macrominerals: Ca, P, Mg, Na, K and Cl, Micro minerals: Co, Cu, Fe, Mn, Zn, F.

Unit-3

8hours

Energy balance: Definition of S.I. units of caloric value of foods- bomb calorimeter. Respiratory quotient (R.Q) - definition, calculation of non- protein R.Q w.r.t carbohydrates and lipids. Measurement of energy expenditure by direct and indirect methods. Basal metabolic rate (BMR) - definition, measurement of BMR by Benedict's Roth apparatus method. Factors affecting BMR.

8hours

Unit-4

Diet: Specific dynamic action of food (SDA) - Energy requirement and recommended dietary allowances (RDA) for different physical activities for children and during pregnancy and lactating women Therapeutic nutrition for diabetes, cardiovascular disease, cancer patients. Osteoporosis and bone health. Wellness diets, fitness diets, obesity and weight management and BMI.

References:

1. Human Nutrition and Dietetics. S Davidson and J.R. Passmore. Churchill Livingstone Publisher.
2. Human Nutrition and Dietetics. J.S. Garrow, W. Philip T. James, Alan Ralph. Churchill Livingstone Publisher.
3. Modern Nutrition in Health and Disease. Michael G. Wohl, Robert S. Good hart, Maurice E. Shils. Lea & Febiger Publisher, U.S.A.
4. Mechanism and Theory in Food Chemistry. DWS Wong. Springer Cham Publishers.
5. Advanced Text Book on Food and Nutrition, Vol. I & II. Swaminathan M. The Bangalore Press.
6. Food Science, 3rd edition. Srilakshmi B. New Age International Publishers (2003).
7. Food, Nutrition and Health. Tapsell L. Oxford University Press (2010).
8. Modern Nutrition in Health and Disease. Maurice E. Shils, Moshe Shike. Lippincott Williams & Wilkins, Philadelphia.



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SEP SYLLABUS FOR B.Sc., COURSE IN BIOCHEMISTRY SEMESTER III (ELECTIVE-2)

BIOCHEMICAL GENETICS

COURSE TITLE	BIOCHEMICAL GENETICS
COURSE CREDITS	02
TOTAL CONTACT HOURS	32
DURATION OF ESA	02
FORMATIVE ASSESSMENT MARKS	10
SUMMATIVE ASSESSMENT MARKS	40

Course Outcome:

- Students will be acquainted with knowledge on genetics of animals, bacteria and viruses, and also it might lead them to know abnormal phenotypic character due genetic variations.

Unit-1

8hours

Introduction: Nature of genetic material. Chromosomes and genes.

Classical Genetics: Mendelian principles: Dominance, segregation, independent assortment, deviation from Mendelian inheritance. Concept of gene: Allele, multiple alleles, pseudo allele, complementation tests, epistasis. Extensions of Mendelian principles: codominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, linkage and crossing over, sex linkage, sex limited and sex influenced characters. Morgan's discovery of sex-linked inheritance of sex-linked genes

Unit-2

8hours

Mutation: types of mutation, mutagens- chemical and physical, molecular basis of mutation: spontaneous and induced mutations, effect of HNO₂ and UV Radiation. Point mutations: concept of missense, nonsense and frameshift mutations mechanism of mutation, induction and isolation of mutants and their role in genetic studies. Mutagenesis, DNA damage and repair.

Unit-3

8hours

Human Genetics: Biochemical events occurring during mitosis and meiosis. Structure of chromatin; nucleosomes and higher orders of organization. Chromosome banding, Chromosome mapping based on recombination frequency data. Transposons. Overview of human genome project, mapping of human genes; techniques used, assignment of important genes. Transposition in human chromosomes. Chromosomal abnormalities

Unit-4

8hours

Bacterial Genetics: Bacterial chromosomes, plasmids; fertility, resistance, colicinogenic and others. Recombination in bacteria. Mechanism of recombination, transposable genetic elements, transformation and conjugation in bacteria. Linkage map of bacterial chromosomes.

Viral Genetics: Life cycles of bacteriophages, lytic cycle; replication of T-phages. Lysogeny and its regulation. Transduction; specialized, generalized and abortive. Fine structure analysis of T-phages; Benzers work, concept of cistrons.

References:

1. Genetics, Strick Berger, M.W. (1990) 3rd edn. McMillan.
2. Human Molecular Genetics; Peter Sudbery, (2002) Printice Hall.
3. Introduction to Modern Virology, Primrose and Dimmock (1988), Blackwell Sc.
4. Genetics and Molecular Biology; Robert Schleif, The Johns Hopkins University Press
5. Baltimore, (1993).
6. Introduction to Genetics: A Molecular Approach; T A Brown, Garland Science (2011).
7. Molecular Cell Biology; Lodish et al., 7th Edn. W.H. Freeman and Co. (2012).
8. Molecular Biology of the Cell; 7th Edn. Bruce Alberts et al., Garland Publications (2008).
9. Principles of Developmental Genetics; S.A. Moody, Academic Press (2007).
10. Human Genetics; Lewis, 7th Edn. WCB & McGraw Hill (2007).
11. Essential Genetics: A Genomics Perspective; Daniel L. Hartl, 6th Edition, Jones and Barlett Learning (2012).
12. Bacterial and Bacteriophage Genetics; Edward A. Birge, 5th Edition, Springer (2006).

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SEP SYLLABUS FOR B.Sc., COURSE IN BIOCHEMISTRY SEMESTER IV

(ELECTIVE-1)

Food preservation, Nutraceuticals and Bioinformatics

COURSE TITLE	Food preservation, Nutraceuticals and Bioinformatics
COURSE CREDITS	02
TOTAL CONTACT HOURS	32
DURATION OF ESA	02
FORMATIVE ASSESSMENT MARKS	10
SUMMATIVE ASSESSMENT MARKS	40

Course Outcome:

- To understand the functions of nutraceuticals and functional foods for the treatment of various disorders.
- To understand the basic principles of food preservations.
- To learn the various preservation techniques and learn their applications
- Student will understand the nature of biological data and need for biological databases
- Student will understand and explore a few major biological databases (organization and contents); search and retrieve data from the databases using their respective search engines

Unit-1

8hours

Food Processing and Preservation – Introduction, Purpose and scope, Principles and Methods of food processing and preservation. Traditional Methods, Preservatives and Additives - Classification, applications, permissible limits and safety aspects.

Methods of Food Processing and Preservation: thermal processing, blanching, pasteurization, UHT processing, canning, extrusion. Refrigeration and freezing, methods of freezing, Dehydration and Concentration.

Processing and Preservation by Novel Methods: Irradiation, High Pressure, Ultrasonic, High Intensity Light, Pulse Electric Field, Ohmic Heating, Pulsed X-rays, Microwave, Radio Frequency, Minimal Processing, Edible Coatings and Films, Membrane Processing, Hurdle Technology, Nanotechnology and Application in foods.

Unit-2

8hours

Nutraceuticals: Organizational elements, classification of nutraceuticals, dietary supplements, fortified foods, functional foods and phyto-nutraceuticals.

Nutraceuticals in Health and Disease - Sources and role of Functional foods and Nutraceuticals- Sources of functional foods and Nutraceuticals, concept of dietary supplements, Phytochemicals, phytosterols, omega 3 and 6 fatty acids, dietary fiber, role of nutraceuticals in health and disease management, non-essential nutrients as dietary supplements, FOSHU foods Use of nutraceuticals in traditional health sciences. Their role in preventing/controlling diseases.

Unit-3

8hours

Basic Bioinformatics: Introduction to bioinformatics, its importance and scope, different disciplines of bioinformatics, relationship with various branches of life sciences. Computational approaches to Biological sciences. Detailed study of various data bases - Definition, information generation, Storage, editing and retrieval. Classification - Database management, public agencies-NCBI data model and structure of EIG and genome net and Gene bank sequence database.

Unit-4

8 hours

Sequence alignment and database searching: Introduction, protein and nucleic acid sequence analysis, models of sequence analysis, tools for sequence search, analysis and alignment. Sequence, comparison by BLASTA and FASTA.

Phylogenetic analysis- Tree building, basic concept and methods of phylogenesis evaluation

Genomic project: An overview of human genome project, Application of bioinformatics.

References:

1. Introduction to Bioinformatics; T K Attwood & D J Parry-Smith, Pearson Education (2002).
2. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins. A.D. Baxevanis, B.F.F. Ouellette, (2005) John Wiley and Son Inc., USA.
3. Bioinformatics Sequence and Genome Analysis. D.W. Mount Cold Spring Harbor Laboratory Press (2004).
4. Introduction to Bioinformatics, A. Tramontano (2007). Chapman & Hall/CRC, USA.
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6. Food Processing Technology: Principles and Practice, New York. 3) Harry. W. Von Loesecke. (1998).
7. Drying and dehydration of Foods, Allied Scientific, New Delhi.
8. Jelen, P. (1985). Introduction to Food Processing, Prentice Hall, Reston Virginia, USA.
9. Lewis, M.J. (1990). Physical Properties of Food and Food Processing Systems, Wood head, UK.
10. Norman, N. Potter, Joseph H. Hotchkiss.(1996). Food Science, 5th edition, CBS Publishers & Distributors, New Delhi.
11. Rama swamy, H. and Marcote, M. (2005). Food processing- principals and

- applications, Tamil Nadu.
12. Vijayakhader. (2000). Text book on food storage and preservation, Kalyani Publishers,
 13. NIIR Board. Modern technology on food preservation, Asia pacific business press, New Delhi

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**SEP SYLLABUS FOR B.Sc., COURSE IN BIOCHEMISTRY
SEMESTER IV**

**(ELECTIVE-2)
PLANT BIOCHEMISTRY**

COURSE TITLE	PLANT BIOCHEMISTRY
COURSE CREDITS	02
TOTAL CONTACT HOURS	32
DURATION OF ESA	02
FORMATIVE ASSESSMENT MARKS	10
SUMMATIVE ASSESSMENT MARKS	40

Course outcomes:

- Student will understand the biochemical processes and metabolic pathways, including photosynthesis, photorespiration in plants
- Student will understand the plant cell, photosynthesis, transporters, and important primary metabolites. Illustrate plant growth regulators, plant's responses to various biotic and abiotic stresses and secondary metabolites and their functional importance.

Unit-1

08 hours

Plant cell- structure and molecular components: Cytoskeleton- an overview. Plant cell division, cell cycle. Outlines of energy production in plant cells,

An overview of photosynthesis: C₃, C₄ plants and crassulacean acid metabolism (CAM); photorespiration; Phytochromes, and phototropins.

Plant cell membranes and membrane transport: Introduction to plant cell membranes and membrane constituents. Organization of transport systems across plant membranes; Different types of pumps operate at plant cell and organelle membranes; importance of H⁺-ATPases. Ion channels - properties and significance; Aquaporins and water transport.

Unit-2

08 hours

Important Primary metabolites of plants: Cellulose, starch, sucrose, oligosaccharides; fructans, gums, mucilages, poly unsaturated fatty acids, lignin, surface waxes, sulfides and sweet proteins.

Plant growth regulators: Auxins, cytokinins, gibberellins, abscisic acid, ethylene, brassinosteroids, salicylic acid.

Unit-3

08 hours

Plant responses to biotic and abiotic stresses: Introduction; Plant pathogens and diseases; plant defense systems - hypersensitive response; systemic acquired resistance; induced systemic resistance; Plant biotic stress response to pathogens and insects.

Plant abiotic stress responses: Salt stress, drought, and heavy metal stress responses; osmotic adjustment and significance of osmotic agents such as proline, sugar alcohols and quaternary ammonium compounds; An overview of oxidative stress and oxidative damage. Antioxidant enzymes and stress tolerance.

Unit-4

08 hours

Plant secondary metabolites (Natural products):

Introduction; secondary metabolites (natural products) definition; classification of plant secondary metabolites (natural products).

Phenolics: Classification of phenolic compounds; Classification of flavonoids; Classification of anthocyanins; Isolation, purification and characterization of phenolics.

Terpenoids: volatile compounds; plant growth regulator terpenoids – gibberellin, abscisic acid; brassinosteroids and saponins Isolation, purification, and characterization of terpenoids

Biological properties of secondary metabolites: Role of secondary metabolites - in plants Physiologically active secondary metabolites in modern medicine and therapeutic compounds for human ailments

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