REVISED UG SYLLABUS UNDER CBCS

(Implemented from Academic Year 2020-21)

PROGRAMME: FOUR YEAR B.Sc.

Domain Subject**: BIOCHEMISTRY**

Skill Enhancement Courses (SECs) for Semester V,
from 2022-23 (Syllabus-Curriculum)

Structure of SECs for Semester – V

(To choose One pair from the Three alternate pairs of SECs)

Univ. Code	Course 6&7	Name of the Course	Th. Hrs. / Week	IE Marks	EE Marks	Credits	Prac. Hrs./ Wk	Marks	Credits
	6A	Clinical Biochemistry	3	25	75	3	3	50	2
	7A	Haematological and Immunological Techniques	3	25	75	3	3	50	2

OR

Univ. Code	Course 6&7	Name of the Course	Th. Hrs. / Week	IE Marks	EE Marks	Credits	Prac. Hrs./ Wk	Marks	Credits
	6B	Food Technology	3	25	75	3	3	50	2
	7B	Food Microbiology	3	25	75	3	3	50	2

OR

Univ. Code	Course 6&7	Name of the Course	Th. Hrs. / Week	IE Marks	EE Marks	Credits	Prac. Hrs./ Wk	Marks	Credits
	6C	Genetic Engineering	3	25	75	3	3	50	2
	7C	Bioinformatics	3	25	75	3	3	50	2

Note-1: *For Semester–V, for the domain subject Biochemistry, any one of the three pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C. The pair shall not be broken (ABC allotment is random, not on any priority basis).*

Note-2: *One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate field skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented.*

Hence, teachers shall also impart practical training to students on the field skills embedded in the syllabus citing related real field situations

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SEC Clinical Biochemistry

Total no of Hours: 30 **Credits -2**

UNIT – I No. of Hours:6

Introduction:

Organization of Clinical laboratory. Introduction to instrumentation and automation in Clinical biochemistry laboratories, safety regulations and first aid. General comments on specimen collection, Type of specimen for biochemical analyses. Precision, accuracy, quality control, precautions and limitations.

Exercises

Collection of blood, separation of plasma, serum and their storage.

UNIT – II No. of Hours: 6

Basics of Hepatic and Renal physiology:

Evaluations of biochemical changes in liver and kidney diseases, Liver function tests (LFTs), Renal function tests (RFTs), GFR. Diagnostic biochemical profile.

Exercises

Estimation of bilirubin (direct and indirect method) serum transaminases (AST, ALT) and serum alkaline phosphatises (ALP).Quantitative determination of serum urea and creatine. Use of urine strips / dip strip method for urine analyses.

UNIT – III No. of Hours: 6

Glucose metabolism

Digestion, absorption and assimilation of carbohydrates. Enzymes and hormones (Insulin, Glucagon) in regulation of blood glucose levels. Clinical significance of variations in blood glucose levels, disorders - Diabetes mellitus, Insulin resistance.

Exercises

Estimation of blood glucose by glucose oxidase - peroxidase method, GTT (Glucose Tolerance Test), HbA1c.

UNIT – IV No of Hours: 6

Lipid profile: Lipids, fats, Triglycerides, cholesterol, fatty acids, PUFAS. Digestion and absorption of lipids. Composition and functions of lipoproteins. Clinical significance of elevated lipoproteins.

Exercises

Estimation of triglycerides, cholesterol, LDL, VLDL and HDL cholesterol.

UNIT – V No of Hours: 6

5. Cardiovascular diseases: Basic cardiovascular physiology, biochemical symptoms associated with cardiovascular diseases and their evaluation. Involvement of enzymes in diagnostics of heart diseases including Aspartate transaminase, Isoenzymes of creatine kinase and lactate dehydrogenase and troponin.

Exercises

Estimation of creatine kinase (CK), LDH.

Suggested readings

1. Medical laboratory technology a procedure manual for routine diagnostic tests. Volume 1, Mukhergee, K.L, Tata Mc Graw hill publishing Company Limited, (New Delhi). ISBN 9780070076594/ISBN-978007007663

2. Medical laboratory technology a procedure manual for routine diagnostic tests.Volume 2, Mukhergee, K.L, Tata Mc Graw hill publishing Company Limited,(New Delhi). ISBN 9780070076648

3. Medical Biochemistry 2005, 2 nd Edition, Bayner, J.W, and Dominiazak, M.H,Elsevier, Mosby Ltd (Philadelphia). ISBN-0/7234/3341/0

4. Experimental Biochemistry, A student companion (2005), Rao, B.S, and Deshpande, V., IK international Pvt.Ltd(NewDelhi) ISBN-8188237/41

5. Clinical diagnosis and management by Lab methods (John Bernard Henry, W.B. Salunders Company, 1984).

6. Clinical Biochemistry – S. Ramakrishnan and Rajiswami.

7. Clinical chemistry in diagnosis and treatment–Joan F.Zilva and P.R.Pannall (Lloyd-Luke Medical Books, 1988).

SRI VENKATESWARA UNIVERSITY

SEC Haematological and Immunological Techniques

Total no of Hours: 30 **Credits -2**

UNIT - I No. of Hours:6

1.Introduction

Organization of Clinical Immunology laboratory. Introduction and maintenance of clinical Immunology laboratory; hazards in clinical laboratory; units; 'normal range', reference values. Factors affecting reference values quality control in laboratory – use of external and internal standards; use of WHO standards.

Exercises

Collection of blood and separation of Serum and their storage. Haemagglutination tests for identification of human blood groups.

UNIT - II No. of Hours: 6

Composition of blood and Lymph

Plasma and cells-RBC, WBC, platelets, blood clotting, plasma proteins, separation and applications, plasma therapy. Lymph.

Exercises

R.B.C. count, Total and differential count in human peripheral blood, Separation of mononuclear cells from human peripheral blood, Enumeration of T & B-cells from human peripheral blood.

UNIT - III No. of Hours: 6

Advanced diagnostic methods

Identification of viral, bacterial and other diseases - ELISA, Western blot, RT-PCR-Tissue Histopathology, fixing, staining (H&E) and microtome sections.

Exercises

Erythrocyte Sedimentation Rate (ESR), Packed Cell Volume (PCV), Estimation of Haemoglobin (Hb), Mean Cell Haemoglobin and Mean Cell RBC volume. H & E staining.

UNIT - IV No of Hours: 6

Auto immunity

Introduction, Auto recognition, classes of auto immuno diseases. (Hashimoto disease, thyrotoxicosis, Systemic lupus erythomatosis, Autoimmune haemolytic anaemia, Rheumatoid arthritis).

Exercises

Tests for Rheumatoid arthritis, Systemic lupus erythomatosis, CRP. Detection of HCG by latex agglutination inhibition test. Widal test, VDRL test.

UNIT – V No of Hours: 6

Immunoglobulins (Igs)

Types of Igs, nature and structure of Igs –Light chain, heavy chain and functions. Adjuvants, Antibody production, enzymatic cleavage of Igs, Haptens.

Exercises

Precipitation & Agglutination reactions, Immuno diffusion & Radial diffusion, Single Radial Immunodiffusion, Ouchterlony double immuno diffusion.

REFERENCE BOOKS

1. Essential Immunology - By I. Roitt, Publ: Blackwell

2. Immunology - By G. Reever & I. Todd, Publ: Blackwell

3. Abbas AK, Lichtman AH, Pillai S. Cellular and Molecular Immunology. Saunders Publication, Philadelphia

4. Golds by RA, Kindt TJ, Osborne BA. Kuby's Immunology. W.H. Freeman and Company, New York

5. Ronald Hoffman, Edward J. Benz Jr., Leslie E. Silberstein, Helen Heslop, Jeffrey Weitz, John Anastasi - Hematology: Basic Principles and Practice, Elsevier Health Sciences, 2012

6. Betty Ciesla, Hematology in Practice, F.A. Davis, 2011.

SRI VENKATESWARA UNIVERSITY

FOOD TECHNOLOGY

Total no of Hours: 30 Credits -2

UNIT-I Number of hours: 06

Food Regulations and Standards

Sampling methods - Sample preparation for analysis; Statistical evaluation of analytical data - Official Methods of Food Analysis. Moisture in foods - determination by different methods - ash content of foods, wet, dry ashing, microwaveashing methods; Significance of Sulphated Ash, water soluble ash and acid insoluble ash in foods determination of dietary fiber and crude fiber.

Exercises

Collection and preservation of food samples for routine analysis. Titratable Acidity in foods.

UNIT-II Number of hours: 06

Analysis of major food components

Determination of total fats in foods by different methods; Analysis of oils and fats for physical and chemical parameters, Quality standards, and adulterants; different methods of determination of protein and amino acids in foods; determination of total carbohydrates, starch, disaccharides and simple sugars in foods.

Exercises

Determination of proteins, fats and carbohydrates

UNIT-III Number of hours: 06

Processing and preservation of foods

Blanching, pasteurization, sterilization, microwave heating. Low Temperature-refrigeration, freezing, dehydro-freezing. Food irradiation. Processing and preservation by drying, concentration and evaporation. Nnon-thermal methods like High pressure, pulsed electric field, hurdle technology. Use and application of enzymes and microorganism in processing and preservation of foods. Refrigeration, freezing.

Exercises

Processing and preservation methods (salting, sodium benzoate, Glucose content by enzymatic method (amylase, invertase)

UNIT-IV Number of hours: 06

Environmental contaminants and drug residues in food:

Fungicide and pesticide residues in foods; heavy metal and their health impacts; use of veterinary drugs (e.g. Malachite green in fish and β-agonists in pork); other contaminants in food, radioactive contamination of food, Food adulteration and potential toxicity of food adulterants. Endocrine disrupters in food.

Exercises

Idenfication of Food dyes, Phenolics, Qualitative detection of adulterants in Atta, Maida, Besan, Biscuit, Black pepper, Butter, Ghee, Chilli, Powder, Honey, Tea, Turmeric powder, soft drink, M.B.R.T. of milk.

UNIT-V

Fermentative food Products

Foods: Processes for preparing fermented products including Yogurt (curd) and other Traditional Indian Products like idli, dosa, dhokla, shrikhand, Soya based products like soya sauce, natto, Cheese.; Alcoholic Beverages based on fruit juices (wines), cereals (whisky, beer, vodka,), sugar cane (rum) Process description, quality of raw materials, fermentation process controls.

Exercises

Wine preparation from fruit juices and molasses, amino acid estimation from Sprouts, identification of microbial strains in yogurt, chocolate preparation

Reference Books

1. A first course in food analysis By A. Y. Sathe.
2. Hand book of analysis and quality control for fruit & vegetable products By S. Ranganathan.
3. Handling and storage of food grains by S. V. Pingale.
4. Food science chemistry & experimental food By Dr. M. Swaminathan.
5. Food chemistry by William Hogland Meyer.
6. Food adulotration By Thankamma Jacob.
7. Food Microbiology by William C. Frazier.
8. Preservation of Fruits and Vegetables by Giridharilal.

SRI VENKATESWARA UNIVERSITY

FOOD MICROBIOLOGY

Total no of Hours: 30 Credits -2

UNIT I Number of hours: 06

History and development of Microbiology-Importance and significance of microorganisms in food science. Bacterial growth curves, Factors affecting the growth of micro organisms in food – Intrinsic and Extrinsic parameters

Exercises

Preparation of common laboratory media and special media. bacterial count by standard plate method (SPC), turbidity method

UNIT II Number of hours: 06

Determination of microorganisms and their products in food: Sampling, sample collection, transport and storage, sample preparation for analysis. Microscopic and culture dependent methods- Direct microscopic observation, culture, enumeration and isolation methods; Chemical and Physical methods-Chemical, immunological and nucleic acid based methods;

Exercises

Isolation and Identification of bacteria by manual methods. Gram's staining, acid-fast, spore staining.

UNIT III

Protection and preservation of Foods: Number of hours: 06

Chemical, Modified atmosphere, Radiation in foods from the microbiological angle. Indicators of water and food safety and quality: Microbiological criteria of foods and their Significance.

Exercises

Microbiological identification of water samples. and food preservation methods

UNIT IV Number of hours: 06

Food spoilage: characteristic features, dynamics and significance of spoilage of different groups of foods - Cereal and cereal products, vegetables and fruits, meat poultry and sea foods, milk and milk products, packed and canned foods.

Exercises

Microbiological analysis of typical processed foods. (Vegetables and fruits, meat poultry and sea foods, milk and milk products)

UNIT V Number of hours: 06

Food borne diseases: *Bacterial borne diseases* (Staphylococcal intoxification, Botulism, Salmonellosis, Shigellosis, Enteropathogenic Escherichia Coli Diarrhoea,Clostridium Perfringens gastroenteritis, Bacillus cereus Gastroenteritics). *Mycotoxins:* Aflatoxicosis, Deoxyni valenol Mycotoxicosis, Ergotism. Drug resistance - phenomena and mechanism.

Exercises

Coli form test

Microbiological analysis of food born bacterial pathogens-(bacillus, clostridium, shigella)

Text books and reference materials

1. Prescott LM Harley JP and Klein DA (2006). Microbiology (7th edition) McGraw Hill, Newyork.
2. Frazier, W.C. (1988) Food Microbiology, Mc Graw Hill Inc. 4th Edition.
3. Vijaya Ramesh,K. (2007) Food Microbiology. MJP publishers, 2007

4. Yasmine Motarjemi and Martin Adams. (2006) Emerging Food borne pathogen- Wood Head Publishing England.

5. Arun, K Bhunia. (2008) Food borne microbial pathogens: Mechanisms and pathogenesis. Springer.

6. Thomas J. Montville, Karl R. Matthews, Kalmia E. Kniel (2012). Food Microbiology: An Introduction, American Society for Microbiology.

7. Dubey, R.C. and Maheswari, D.K. (2008) Text book of Microbiology. S Chand Publishing.

SRI VENKATESWARA UNIVERSITY

SEC-GENETIC ENGINEERING

Total No. Of Hours: 30 **Credits -2**

UNIT -I No. of Hours:6

Basics of Genetic engineering

Introduction, historical prospective, basics of cloning Vectors, Restriction enzymes, plasmids PBR 322, PUC vector, Cosmids, YACs, cDNA libraries.

Exercise: PCR, Restriction mapping.

UNIT -II No. of Hours:6

Genetic Engineering in Animals

Gene Transfer methods in Animals. Transfection. Microinjection, Embryonic-stem cells Gene transfer and Retro-virus Gene transfer methods to create transgenic animals. Applications of transgenic animals in agriculture, medicine and pharmaceuticals.

Exercise: Cacl2 mediated transfection

UNIT -III No. of Hours:6

Genetic engineering in Plants

Manipulation of Plant Genes-Electroporation, Shotgun method, Agrobacterium mediated gene transfer. Applications in Crop improvement, disease and pest resistance, tolerance to environmental stresses. Genetically engineered foods.

Exercise: Transformation. Restriction Fragment Length Polymorphism (RFLP)

UNIT- IV No. of Hours:6

Genetic engineering in Microorganisms

Gene transfer methods in microorganisms - transformation, transduction and conjugation. Transposans.

Exercise:

Isolation of DNA, plasmid, sequencing of gene, synthesis of genes, Random Amplified Polymorphic DNA (RAPD)

UNIT- V No. of Hours:6

Genetic engineering-Environment

Bioremediation Biodegradation**,** Biofuels and Bioplastics from genetically engineered oil seed rape and other crops as substitutes for fossil fuels, which should not worsen the Greenhouse effect. Biosensors.

Suggested books

1. Genes and Probes, A Practical Approach Series (1995) by Hames and SJ Higgins; Oxford
2. Gel Electrophoresis of Nucleic Acids, A practical Approach (1990) by D Rickwood and BD Hames. Oxford Univ. Press.
3. Genetics by Gardinar
4. Biotechnology by U.Satyanarayana

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SEC-BIOINFORMATICS

Total No. Of Hours: 30 **Credits -2**

UNIT- I

Scope of Bioinformatics No. of Hours:6

Genomics, structural and functional genomics, genome annotations, gene production approaches and tools. DNA microarray and computational analysis tools. Computer aided drug design and systems biology.

Exercises

Biological data bases, drug design

UNIT- II

Biological data bases No. of Hours:6

Introduction to biological databases. Primary, secondary and composite databases, NCBI, EBI, Nucleic acid databases (Gene Bank), EHBL, DDBJ, NDB) protein database, (PIR, Swissport, TrEHDL, PDB) Metabolic databases (KEGG, EcoCyel).

Exercises

Demonstration on Nucleic acid and protein databases

UNIT -III No. of Hours:6

Sequence Alignments:

Similarity, identities and homology. Concept of alignment pairwise sequence alignment, gaps, gap-penalties, scoring matrices, PAM 250, BLOSUM62, Local and Global Sequence alignment, multiple sequence alignment, progressive alignment, Logarithm alignment. Application of multiple sequence alignment- CLUSTAL W, BLAST-blastn, blastp and blastx

Exercises

Simple and multiple Sequence alignment, BLAST.

UNIT- IV No. of Hours:6

Genome projects

General introduction to genome projects (rice and Mycobacterium tuberculosis genome project). Special emphasis on Human Genome Project (HGP). Science behind HGP, benefits of HGP, genetic testing standard, quality and commercialization.

Exercises

Genomes of various plants and animals

UNIT- V No. of Hours:6

Proteomics

Introduction, principle, technique, 2-D data base. Gel analysis, post gel analysis, MALDITOF. Significance and applications of proteomics in modern biology.

Exercises

SDS-PAGE, IEF (2-D gel analysis), protein and peptides by MALDI-TOF

Suggested books

1. Genome Mapping: A practical approach. Dear P (Editor). 1st Ed. 2000. Oxford University.
2. Developing Bioinformatics Skills. Alfonso Valencia and Blaschke. L (2005) Oreilles
3. Bioinformatics sequence, structure and data banks ed. By Des Higgins Willie Taylor (2006).
4. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins" (Andreas D. Baxevanis, B. F. Ouellette), Paperback, 2nd ed., 470 pp., ISBN: 0471383910, Publisher: Wiley, John & Sons, Inc.Pub.

5. David W. Mount, Bioinformatics: Sequence and Genome Analysis, 2nd edition, Cold Spring Harbor Laboratory, 2004.

6. Introduction to Bioinformatics by T.K. Altwood and D.J Parry-Smith (Pearson Education Asia1999).