Choice based Credit System Syllabus for M. Sc. Biochemistry, Session/year 2018 Nov. onwards

Session/Year 2018 Nov. (Onwards)
### Semester 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Category</th>
<th>Hrs./Wk.</th>
<th>Credits</th>
<th>Names of Instructors</th>
<th>Max. Marks</th>
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26 credits, 33 contact hrs.

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### Instructors:

**AM:** Akbar Masood  
**SA:** Shajrul Amin  
**RH:** Rabia Hamid  
**NAD:** Nazir Ahmad Dar  
**SAA:** Shaida Ahmad Andrabi  
**SAG:** Showkat Ahmad Ganie  
**AD:** Mohd Ashraf Dar  
**TA.** Teaching Assistant

### Abbreviations

- **CR:** Core (For Department students)  
- **DCE:** Discipline Centric (For Department Students)  
- **GE:** General Elective (For within Faculty students)  
- **OE:** Open Elective (For non-faculty students)
SEMESTER 1

BCH - 18101CR: Biomolecules

Unit-I
Carbohydrates
Definition, classification, characterization and biological importance of mono- and disaccharides
   Structure and conformation of sugars
   Stereo- and optical isomerisms
   Structure and function of homo- and heteropolysaccharides
   Mucopolysaccharides and proteoglycans
   Chemical reactions of functional groups present in carbohydrates

Unit-II
Lipids
   Classification of lipids
   Chemical composition and properties of triglycerides
   Nomenclature and properties of saturated and unsaturated fatty acids
   Properties and functions of phosphoglycerides and sphingolipids
   Structure and functions of steroids (cholesterol and bile acids)
   Prostanoids

Unit-III
Amino acids
   Structure, classification and physiochemical properties
   Essential and non-essential amino acids
   Characteristics of a peptide bond
   Oligo-peptides and polypeptides
   Chemical synthesis of a peptide

Proteins
   Levels of protein structure
   Elucidation of primary structure
   Forces stabilizing the tertiary structure
   Protein denaturation and renaturation

Unit- IV
Nucleic Acids
   Primary, secondary and tertiary structure of DNA
   Various forms of DNA, structural polymorphism of DNA
   Properties of DNA
   Denaturation and annealing of DNA, Cot Curve
   DNA as a genetic material
   Primary, secondary and tertiary structure of RNA
   Functions of various types of RNA

BCH – 18102CR: Cell Biology- I

Unit-I
Basic properties of cells
Structural organization of prokaryotic and eukaryotic cells
Introduction of viruses
Cell membrane
  Chemical composition
  Structure and function of membrane proteins
  Membrane lipids and membrane fluidity
  Dynamic nature of plasma membrane
  Movement of substance across cell membrane
  Membrane potentials
Mitochondria
  Structure and function
  Oxidative metabolism in mitochondria
  Role of mitochondria in ATP formation
  Translocation of protons and establishment of a proton motive force

Unit-II
  Introduction to endomembrane system
  Approaches to study endomembrane
  Endoplasmic reticulum, structure, functions
  Golgi complex
  Types of vesicle transport and their types
  Lysosomes and plant vacuoles, peroxisomes
  Moving membranes and materials into the cell interior
  Posttranslational uptake of proteins by peroxisome, mitochondria and chloroplasts

Unit-III
  Cell wall
    Detailed structure and functions of Cell wall
    Microbodies
  Chloroplast
    Structure, function
    Photosynthetic units and reaction centers
    Photophosphorylation

Unit IV
  Extracellular matrix and cell interaction
    Extracellular space
    Interaction of cells with extracellular material
    Tight Junction- sealing the extracellular space
    Cell -cell adhesion
    Cell -cell communication
  The cytoskeleton
    Microtubules
    Intermediate filaments
    Microfilaments
**BCH-18103CR: Plant Biochemistry**

**Unit-I**
Photosynthesis
  - Photosynthesis in higher plants – general concepts
  - Organization of the photosynthetic apparatus
  - Mechanism of electron transport in photosynthesis
  - Proton transport and ATP synthesis
  - Calvin cycle and its regulation
  - C4 and CAM pathways
  - Repair and regulation of photosynthetic machinery
  - Photorespiration and its significance

**Unit-II**
Assimilation of mineral nutrients
  - Nitrate and ammonia assimilation and their incorporation into amino acids
  - Biochemistry of nitrogen fixation, nitrogenase complex and its functions
  - Nitrogen fixation genes and their regulation
  - Sulfate reduction and assimilation
  - Sulfite oxidation

**Unit-III**
Special features of secondary plant metabolism
  - Secondary metabolites - phenolics, tannins, lignins, lignans, pigments, terpenes, alkaloids and surface waxes – their biosynthesis and physiological role
  - Plant defense against pathogens
  - Translocation of inorganic and organic substances
  - Pathways of translocation and mechanism of translocation in the phloem

**Unit-IV**
Plant growth regulators
- Auxins
  - Chemical nature, biosynthesis and metabolism
  - Physiological and developments effects,
  - Molecular basis of its action
- Gibberlins
  - Chemical structure, biosynthesis, metabolism and mechanism of its molecular effects
- Cytokinin
  - Properties and biological role
  - Cellular and molecular modes of cytokinin action
- Abscisic acid
  - Chemical structure, metabolism and transport
  - Molecular effects in the regulation of growth and development
**BCH – 18104CR: Laboratory Course - I**

Concept of pH and buffers  
Qualitative estimations of carbohydrates and amino acids  
Quantitative estimation of proteins by  
  Lowry’s method  
  Bradford’s methods  
  Spectrophotometric methods  
Quantitative estimation of cholesterol by Zlatki’s method  
Quantitative estimation of glucose by  
  Nelson Somogy’s method  
  Enzymatic method  
Determination of iodine and saponification value of oils  
Titrimetric estimation of vitamin C  
Paper chromatography of simple sugars/amino acids

**BCH -18101DCE: Cell Biology II**

**Unit-I**  
Structure and function of:  
  Nucleus  
  Nucleolus  
Chromosomes the physical carrier of the genes  
Chromosome and chromatin structure  
Structure and composition of gene  
Histones and histone modifications  
Concept of Epigenetics

**Unit II**  
Cell cycle and its stages  
Regulation of cell cycle  
Mitosis  
  Prophase, prometaphase, metaphase, anaphase, telophase, cytokinesis  
  Motor proteins and their role in cell division  
Cytokinesis Meiosis  
  The stages of meiosis  
Genetic recombination during meiosis Gene as unit of inheritance

**Unit III**  
Cell signaling  
  The basic elements of cell signaling  
  Signaling molecules and their receptors  
Functions of G-protein- coupled receptors and their second messengers  
Protein phosphorylation and its role in signal transduction  
Cytokine receptors  
Role of calcium and NO as an intracellular messenger  
Detailed mechanism of signaling in the following pathways:
Unit-IV
Cancer Biology
Basic concepts of cancer biology
Causes of cancer
Genetic of cancer
Properties of cancer cell
Hallmarks of cancer
  Self-sufficiency in growth signals
  Insensitivity to antigrowth signals
  Evading apoptosis
  Sustained angiogenesis
  Limitless replicative potential
  Tissue invasion and metastasis

BCH -18102DCE: Biochemical Techniques

Unit-I
Centrifugation
  Basic principle of centrifugation
  Factors affecting sedimentation
  Types of centrifugation including differential, density gradient and ultracentrifugation
  Analytical and preparative centrifugation
  Applications of centrifugation
Chromatographic techniques
  Basic principle and applications of chromatographic techniques:
    Gel filtration chromatography
    Affinity chromatography
    Gas chromatography
    Ion Exchange chromatography
    High-pressure liquid chromatography

Unit-II
Electrophoresis
  Types of electrophoresis
  Factors affecting electrophoretic mobility
  Uses of electrophoresis
Isoelectric focusing
Analysis of biomolecules using UV/visible, fluorescence spectroscopy
Use of radioisotopes in biology
Their detection, measurement and safety guidelines

Unit-III

Session/Year 2018 Nov. (Onwards)
Different blotting techniques
  Northern, Southern
Polymerase chain reaction,
  Overlap extension PCR,
  Multiplex, Gradient and Nested PCR,
  RT-PCR
Principles of - RFLP, RAPD and AFLP techniques
Single strand conformation polymorphism and heteroduplex analysis
Mutagenesis
Preparation and analysis of RNA and DNA probes and tags

Unit-IV
Detection of molecules in living cells, in situ localization by techniques such as FISH and GISH,
Methods for analysis of gene expression at RNA level and protein level, qPCR, large-scale expression analysis using micro array analysis.
Flow-cytometry
Microscopy
Light, electron (scanning and transmission), phase contrast and fluorescence microscopy
Freeze- fracture techniques
Confocal Microscopy
**BCH – 18001GE/OE: Fundamentals of Biochemistry**

**Unit I**
Water and its role in biological systems
Introduction and roles of biomolecules of life
  - Proteins
  - Carbohydrates
  - Lipids
  - Nucleic acids
  - Micronutrients

**Unit II**
Cell as a basic unit of life
Cell components
Functions of the various components
Cell death and its causes
Cell division as the unit of propagation
Concepts of Mitosis and Meiosis
SEMESTER II

BCH – 182101CR: Metabolism - I

Unit-I
Bioenergetics
   Energy transformation by biological systems
   Concept and significance of free energy
   Phosphoryl transfer potential
   Coupled reactions
   ATP as energy currency
Metabolon concept

Unit-II
Carbohydrate metabolism
   Glycolysis
   Citric acid cycle, its function in energy generation and biosynthesis of energy rich-bonds
   Pentose phosphate pathway and its regulation
   Alternate pathways of carbohydrate metabolism
   Gluconeogenesis
   Biosynthesis of glycogen and starch

Unit-III
Lipid metabolism
   Fatty acid oxidation- α, β, ω, oxidation and lipo-oxidation.
   Fatty acid biosynthesis- Acetyl CoA carboxylase, Desaturase and elongase
   Biosynthesis of triacylglycerols, Phosphoglycerides and sphingolipids
   Biosynthetic pathways for terpenes, steroids and prostaglandins
   Ketone bodies- Formation and utilization

Unit-IV
Regulation of carbohydrate and lipid metabolism -hormonal/enzymatic
Interactions between carbohydrate and lipid metabolism – role of insulin and adiponectin
Inborn errors of carbohydrate and lipid metabolism

BCH – 18202CR: Molecular Biology

Unit-I
Replication
   Unit of replication,
   Replication Origin and Replication Fork
   Enzymes involved in replication,
   Initiation, Elongation and Termination of Replication
   Fidelity of Replication,
Unit-II
Transcription
- Transcription in prokaryotes and eukaryotes
- Transcriptional factors and their role
- RNA polymerases
- Formation of initiation complex
- Elongation and termination
- Inhibitors of transcription

RNA processing, splicing, polyadenylation, capping
Structure and function of different types of RNA’s

Unit-III
Regulation of gene expression
- Prokaryotes
- Eukaryotes
- Viruses

Transcriptional activators and repressors
Role of chromatin in regulating gene expression and gene silencing
Epigenetics and its importance in regulation of gene expression

Unit- IV
Translation
Protein synthesis and genetic code
- General characteristics of genetic code
- Deciphering of genetic code

Ribosomes as the site of protein synthesis, polysomes
Activation of amino acids
Chain initiation, elongation and termination in prokaryotes and eukaryotes
Control of translation (Role of Guanine nucleotides).
Translational fidelity, Kinetic proof reading
Positive and negative regulation of translation
Inhibitors of protein synthesis

BCH-18203CR: Advanced Techniques
Unit I
Protein detection and protein-protein interaction Techniques
Western blotting and its applications, Far western blotting, dot blotting,
- Immunoprecipitation, Co-Immunoprecipitation,
- Yeast Two Hybrid screening, FRET, FREP,
- Analysis of interacting proteins with SPR spectroscopy,
- Eastern Blotting,
- Mass spectrometry

Protein-DNA interaction techniques
Gel Retardation Assay, DNase I Foot Printing analysis, ChIP, ChIP-Seq, DNA pull down assays, Reporter assay (Leuciferase reporter assay), Microplate capture and detection assay
Unit II

RNA interference: siRNA, micro RNA and shRNA mediated gene silencing, Ribozyme mediated gene silencing; Cre-Lox recombination system in gene knockout approaches, CRISPR-Cas9 in gene silencing and knockout approaches. Genome editing with: CRISPR-Cas9 technology, TALEN system, Zinc finger system
DNA Sequencing
Next generation sequencing
  Sequencing while synthesizing, Ion Torrent/semiconductor etc
Genome wide and Whole genome sequencing, GWAS,
Transcriptome and Exome sequencing.

**BCH – 18204CR: Laboratory Course - II**

Extraction and assay of enzymes.
Effect of temperature, pH, and time on enzyme activity.
Isolation and purification of proteins using ion-exchange and gel filtration columns
Polyacrylamide gel electrophoresis of purified proteins
Electrophoretic separation of serum proteins.
Molecular weight determination by gel filtration chromatography and SDS-PAGE.
Subcellular fractionation of organelles from liver cells and identification by the use of marker enzymes.
Estimation of SGPT
Estimation of SGOT
Estimation of alkaline phosphatase

**BCH - 18201DCE: Enzymology**

**Unit-I**
Enzyme classification and nomenclature
Methods of examining enzyme – substrate complexes
Enzyme kinetics
An introduction, factors influencing enzyme reaction velocity
Henri and Michealis Menten equation, Briggs-Haldane modification
Determination and significance of kinetic constants
Derivation of rate expression for Ping Pong and ordered Bi Bi reaction mechanism

**Unit-II**
Enzyme inhibition
Reversible inhibition, its types
Determination of inhibitor constants
Irreversible inhibition
Enzyme assays
Mechanism of catalysis of -
Serine proteases
Triose phosphate isomerases

**Unit-III**
Enzyme regulation
General mechanism of enzyme regulation
Allosteric enzymes
Sigmoidal kinetics and their physiological significance
Symmetric and sequential modes for action of allosteric enzymes and their significance
Feed back inhibition and feed forward stimulation
Reversible and irreversible covalent modifications of enzymes

**Unit IV**
Immobilization of enzymes
  - Methods of enzyme immobilization
  - Effects of partition on kinetics and performance with particular emphasis on changes in pH and hydrophobicity
  - Applications of immobilized enzymes

**BCH-18202DCE: Metabolism II**

**Unit-I**
Amino acid metabolism
Specific aspects
Metabolic fates of amino groups
Pathways of amino acid catabolism
Inborn errors of amino acid metabolism

**Unit II**
Overview of Nitrogen Metabolism
Nitrogen excretion and urea cycle,
Biosynthesis of amino acids
Derivatives of Amino acids

**Unit III**
Nucleic Acid metabolism
Biosynthesis of purines and pyrimidines
Degradation of purines and pyrimidines
Structure and regulation of ribonucleotide reductase
Biosynthesis of ribonucleotides, deoxy ribonucleotides and polynucleotides
Inhibitors of nucleic acid biosynthesis

**Unit-IV**
Metabolite transport across mitochondrial membrane
Oxidative phosphorylation
Structural organization of respiratory chain
Electron flow in respiratory chain
Coupling of oxidation and phosphorylation
Structure and function of ATP-synthase complex
Short-circuiting of proton gradient
Regulation of rate of oxidative phosphorylation
**BCH – 18002GE/OE: Protein Biochemistry**

**Unit I**
- Amino acids, the building blocks of proteins
- Protein – a molecule with myriad of functions
- Primary structure of the protein and its determination
- Secondary structure, types
- Tertiary structure, forces stabilizing tertiary structures
- Quaternary structures

**Unit II**
- Quantitative estimation of proteins by Lowry’s method
- Bradford’s method
- Spectrophotometric method
- Polyacrylamide gel electrophoresis of purified proteins
- Molecular weight determination by gel filtration chromatography and SDS-PAGE.

**BCH – 18003GE/OE: Chronic Diseases – Cancer and Diabetes**

**Unit I**
- Cancer - an Introduction
- Various known causes of cancer
- Cancers in Kashmir
- Signs and symptoms
- Cancer diagnosis
- Management of cancer patients
- Cancer prognosis
- Responsibility of patients and attendants
- Facilities of cancer care in developing world

**Unit II**
- Glucose Metabolism
- Organs and enzymes
- What is diabetes?
- Causes of diabetes
- Diagnosis of diabetes
- Incidence of diabetes in Kashmir
- Treatment of diabetic patients
- Diet control and physical exercise
- Impact of diabetes on society
- Preventive measures
SEMESTER III

BCH – 18301CR; Immunology

Unit-I
Historical perspective, terms associated with immunology,
Antigenicity, Features of Antigeneticiy, super antigens, adjuvants.
Cells of immune system: Myeloid, Mononuclear cells, T-Lymphocytes, B-Lymphocytes, NK-Cells
Primary and secondary lymphoid organs: Thymus, Bursa of fabricus, Peyers Patch, spleen, lymph nodes, mucosal associated and cutaneous associated lymphoid tissues.

Unit - II
Immunoglobulin, structure, classes and subclasses
Multigene organization of Ig gene, variable region gene rearrangements, allelic exclusion, generation of diversity of Ig, Assembly and secretion of Ig, class switch, regulation of Ig transcription.
Humoral and cell mediated immunity: B cell development and activation, BCR, T cell development and activation, TCR.
Regulation of system: complement cascade, Biological function and its regulation.
Introduction to cytokines.

Unit - III
Major histo-compatibility complex: different classes, organization and biological function. Transcription regulation of MHC
Hypersensitivity: Type I, II, III, and IV
Autoimmunity and autoimmune diseases
Single organ and systemic autoimmune diseases
Brief introduction to Primary and secondary immunodeficiencies, AIDS
Mechanisms of transplantation. Examples of organ transplantation.
Examples of immune response to Viruses, bacteria, protozoa, fungal and helminthic infection

Unit-IV
Immunoblotting and diagnosis of various important diseases, only infectious and few cancerous types
Techniques – ELISA, RIA, fluorescent IA, agglutination of pathogenic bacteria, Haemagglutination and its inhibition. Affinity, avidity
Immunoelectron microscopy
Enumeration of total T-cell numbers by sRBC, resetting technique
Determination of total number of B-lymphocytes by staining for surface IgG.
Antigen – antibody interaction and its applications.
Total hemolytic assay

Session/Year 2018 Nov. (Onwards)
BCH – 18302CR: Biotechnology

Unit I
Recombinant DNA Technology:
Vectors: Plasmids, bacteriophages, phagemids, cosmids, YACs, and BACs
Methods of creating recombinant DNA molecule
Transformation and screening of recombinant vector
Confirmation of insert
Expression strategies in different hosts, vector and host engineering

Unit II:
Types of restriction endonucleases
Library construction
Types of libraries:
cDNA and genomic libraries
Primary, secondary and tertiary screening methods

Unit III:
Animal Cell Culture:
Primary and established cell lines
Types of various cell lines
Biology and characterization of the cultured cells.
Introduction to balanced salt solutions and simple growth medium.
Role of CO2, serum and supplements. Serum and serum free media, defined media and their applications, antibiotics
Immortalization and methods used to immortalize cells.
Viability and cytotoxicity assays: Trypan blue, MTT, TUNEL and ELISA based assays.
Concept of Plant Cell culture

Unit- IV :
Immunobiotechnology
Development of Monoclonal Antibodies by:
Hybridoma Technology
Applications of MCA and Antibody Fragments.
Vaccination: Conventional and genetically engineered vaccines.
Lymphokines – production and applications

BCH – 18303CR: Enzyme Immobilization

Unit1
Enzymes as proteins and catalysts
Factors that affect the enzyme activity
Characteristics of free vs. immobilized enzymes
Methods of enzyme immobilization,
Effect of immobilization on enzyme activity, partitioning/ diffusion limitations.
Enzyme conformational changes. Enzyme stability and zulu effect.

Session/Year 2018 Nov. (Onwards)
Enzyme activity dependence on pH, partitioning of protons and limitation of proton diffusion

**Unit II**
Immobilized enzymes-
Hydrolysis of proteins, cheese manufacture, conversion of corn-starch to dextrose, conversion of dextrose to fructose, hydrolysis of lactose in whey
Biomedical and Analytical applications.
Concept of Red Blood Cells as carrier of enzymes,
Practical demonstration of immobilization process using RBCs

**BCH – 18304CR: Laboratory Course - III**

Isolation of DNA: Different Methods, Different sources
Quantification of DNA by Spectroscopy
Electrophoresis of Isolated DNA
Amplification of a DNA segment by PCR
Purification of PCR product
Restriction digestion of PCR product
Isolation of RNA from leukocytes
cDNA synthesis from mRNA

**BCH-18301DCE: Nutritional Biochemistry**

**Unit-I**
Composition of human body
Energy content of foods Measurement of energy expenditure Direct & indirect calorimetry
BMR and SDA and factors affecting them
Energy requirements of man and woman and factors affecting energy requirements
Protein nutrition
Proteins reserves of human body
Nitrogen balance studies and factors influencing nitrogen balance
Essential amino acids for man and concept of protein quality
Cereal protein and their limiting amino acids
Protein energy malnutrition (PEM). Etiology, clinical features, metabolic disorders and management of marasmus and kwashiorkor
Basic concept of high protein low caloric weight reduction diets

**Unit-II**
Carbohydrate nutrition
Dietary requirement and sources of carbohydrates
Protein sparing action
Simple and complex carbohydrates Physiological actions of dietary fibers
Mineral nutrients
Nutritional significance of dietary calcium, phosphorus, magnesium, iron, iodine, zinc and copper

**Unit-III**
Lipid nutrition
Major classes of dietary lipids
Properties and composition of plasma lipoproteins
Dietary needs of lipids
Essential fatty acids and their physiological functions
Obesity
Definition and classification
Genetic and environment factors leading to obesity
Obesity related diseases and management of obesity Role of leptin in regulation of body mass

**Unit-IV**
Micronutrition
Dietary sources of vitamins
Biochemical functions and specific deficiency diseases associated with fat and water soluble vitamins
Hypervitaminosis symptoms of fat- soluble vitamins
**BCH – 18302DCE: Physiology And Clinical Biochemistry**

**Unit-I**
- Hematology
- Composition of blood
- Mechanism and regulation of blood coagulation, fibrinolysis
- Neuro-muscular system
- Mechanism of conduction of nerve impulse along axon, neurotransmitters
- Biochemistry of vision
- Ultra structure and molecular mechanism of contraction of skeleton and smooth muscles and its regulation

**Unit-II**
- Gastrointestinal physiology
- Digestion and absorption
- Gastrointestinal disorders
- Excretory system
- Formation of urine
- Normal and abnormal constituents of urine

**Unit – III**
- Introduction to clinical biochemistry
- Water and electrolyte balance
- Regulation of water and electrolyte balance, role of kidney and hormones
- Acid base balance regulation by human body, concept of metabolic and respiratory acidosis and alkalosis

**Unit – IV**
- Principles of diagnostic enzymology
- Evaluation of organ function tests
- Clinical presentation and diagnosis of renal, hepatic and pancreatic diseases
- Cardiac function tests and Thyroid function tests
- Diagnostic significance and interpretation of glucose tolerance test
- Diagnostic tests for Apo lipoproteins, HDL cholesterol, LDL cholesterol and triglyceride disorders

**BCH – 19004GE/OE: Metabolic Disorders**

**Unit I**
- Introduction to carbohydrates, lipids and their metabolism
- Disorders of carbohydrate metabolism
  - Diabetes
  - Hereditary fructose intolerance
  - Lactose intolerance
  - Glycogen storage diseases
- Disorders of Lipid Metabolism
  - Hypercholesterolemia,
  - Atherosclerosis,
  - Carnitine related diseases
Unit II
Introduction to amino acids, proteins and nucleic acids
Inherited disorders of amino acid metabolism - Phenylketonuria, Alkaptonuria, Maple syrup urine disease
Nonketotic hyperglycinemia, Propionic acidemia, Hyperprolinemia
Urea cycle disorders -
  Hyperammonemia Argininemia,
  Deficiency diseases related to Urea cycle enzymes
Disorders of nucleic acid metabolism
  Purine and Pyrimidine metabolism related diseases,
  Hypo and Hyperuricemia,
  Gout, Lesch Nyhan Syndrome, Severe Combined Immunodeficiency Disease (SCID),
  Xeroderma pigmentosum.
SEMESTER IV

BCH – 184001CR: Designing and Drafting of Research the Project

A student will have to pick up a problem in biological sciences and develop a grant application on the theme under mentorship of allotted supervisor. Grant application will have following components.
  - Introduction
  - National and international scenario
  - Review of literature
  - Objective
  - Possible outcome
  - Significance of the study
  - Material and methods
  - Summary

BCH – 18402CR: Journal Club

The recent and advanced scientific papers in high profile journals will be chosen by the students in consultation with mentor teachers and then presented by the student. The presenter is supposed to have all the relevant knowledge of the article. The audience will include faculty, research scholars and PG students.

BCH – 18403CR: Laboratory Course - IV

Bacterial culture methods
Preparation of plasmid DNA by:
  - Manual
  - Kit
Plasmid Transformation
Cloning in plasmid
Western blotting
Simple staining
Gram staining

BCH – 18401DCE: Endocrinology

Unit I
Introduction to endocrinology
Mechanism of action of hormones - hormone receptors, second messenger mechanisms for mediating intracellular hormone functions
Structure, biosynthesis, secretion, transport, mechanism of action and physiological role of
Pancreatic and Thyroid hormones

Session/Year 2018 Nov. (Onwards)
Unit II
Pituitary hormones and their control by hypothalamus
Structure, biosynthesis, secretion, transport, mechanism of action and physiological role of
   Adrenal,
   Gastrointestinal,
   Sex hormones

BCH – 18402DCE: Microbiology

Unit-I
Historical perspectives of microbiology
Importance of microbiology in agriculture, human and animal health industry and environment
Microbial classification
Types of microorganisms
General characteristics of main groups of microorganisms
Criteria used in the classification of microorganisms- cytology, genetics, host specialization, serology
Microbial growth
Different phases of microbial growth
Measurement of microbial growth
Effects of various environmental factors on microbial growth
Control of microbial growth, physical control, chemical control and antibiotics
Mechanism of drug resistance

Unit-II
Isolation, culture, identification and preservation of bacteria
Gram positive and gram negative organisms
Structure and functions of peptidoglycan in gram positive and gram negative organisms
Functions of polymeric components in outer membrane and acidic polymers in gram negative organisms
Special features of bacterial metabolism

Unit-III
Microbial nutrition
Nutritional types of microorganisms
Uptake of nutrients by the microbial cells
Nutritional requirement of bacteria
Resident flora
The human as a habitat
Pathogenicity and virulence factors
Bacterial toxigenecity (pathogenesis of infectious diseases)
Food spoilage, fermentation, food-borne infection
Biochemistry of nitrogen fixation and sulfur reduction

Unit-IV
Virus classification
Structure of virus
Viral proteins and methods of assay
Virus-host interaction
Microbial diseases
Respiratory diseases caused by viruses and bacteria – tuberculosis, small pox
Sexually transmitted diseases including AIDS

**BCH-18403 DCE: Basics of Biostatistics**

Unit-I
Data – Data types, measurement scales
Measures of Central tendencies: Arithmetic mean, Geometric mean, Harmonic mean), Median and Mode.
Measures of Variation – Range, Quartile deviation, Percentile, Mean deviation and Standard deviation, Coefficient of variation.
Concept of Probability – Random experiment, outcome, trial and event, Exhaustive events, favourable events, Independent events, sample space, definition of probability, addition theorem of probability.
Concept of random variables.
Probability Distribution: Binomial, Poisson, Normal Distribution:
Properties and Applications.
Unit II
Hypothesis Testing: Introduction,
Types of Hypothesis, one and two tailed test,
Types of errors, level of significance,
Power of a test, p-value, Z-test for a population mean (Variance known).
Z-test for two population means (variance known and unequal),
t-test for a population mean. t-test for two population means (variance unknown and equal),
t-test for paired data,
chi square test for independence of attributes & fisher exact test tests. one way ANOVA.

BCH-18003GE/OE: Signal Transduction

Unit-I

Cell signaling:
- Basic concepts of Signal Transduction
- Components and general mechanism of Signal Transduction
- Signaling motifs: SH2, SH3, PH and PDZ domains
- Role of protein kinases in cell signaling: Serine/Threonine and Tyrosine kinases

Unit-II

Pathways of intra cellular signal transduction:
- GPCR pathway
- RAS MAPK pathway
- PI3 Kinase Pathway
- Techniques to study Signal Transduction

BCH – 18006GE/OE: Biochemical Laboratory Tests and Interpretation

Unit I
- Concept of reference values
- Observed values
- Blood biochemistry
- Electrolytes estimation and clinical significance
- Blood gas analysis
- Blood sugar and its clinical importance

Unit II
- Cardiac function tests and clinical uses
- Liver function tests: diagnostic importance
- Kidney function test importance
- Tumor markers – PSA, carbohydrate markers

Session/Year 2018 Nov. (Onwards)