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Summary of courses and credits of various study components included in the Programme

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<th>Study components</th>
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Accumulated Total Minimum Credits required for Programmes of study = 120 Credits. Minimum Credits for Social Services/Extension Activity = 1 Credit Minimum Duration = 6 Semesters

Scheme of Examination, Evaluation:

- Each theory examinations are of 3 hours (for core, elective and open).
- Practical examination is of six hours duration.
- Evaluation and grading are in accordance with the general guidelines given by the university.
- Evaluation of each course shall be done in percentage score and shall involve Continuous Evaluation (CE) and End Semester Evaluation.
- The CE and ESE ration shall be 1:4 for both courses with or without practical.
- There shall be a maximum of 80 marks for ESE and maximum of 20 marks for CE.

1. Attendance (Max. marks 5)

The allotment of marks for attendance shall be as follows:

- Attendance less than 75%: 1 Mark
- 75% & less than 80%: 2 Marks
- 80% & less than 85%: 3 Marks
- 85% & less than 90%: 4 Marks
- 90% & above: 5 Marks

2. Assignments or Seminars: (Max. Marks 5)

Each student shall be required to do one assignment or one seminar for each Course. Valued assignments shall be returned to the students. The seminars shall be organized by the teacher/teachers in charge of CE and the same shall be assessed by a group of teachers including the teacher/teachers in charge of that Course. Assignments/Seminar shall be graded on the basis of their quality. The teacher shall define the expected quality of an assignment in terms of structure, content, presentation etc. and inform the same to the students. Due weight shall be given for punctuality in submission. Seminar shall be similarly evaluated in terms of structure, content, presentation, interaction etc.
3. Tests: (Max. Marks 10)

For each Course there shall be one class test during a Semester. Valued answer script shall be made available to the students for perusal within 10 working days from the date of the test. The marks of CE shall be consolidated by adding the marks for attendance, assignment / seminar and test paper respectively for a particular course.

The marks for the components of Practical for Continues Evaluation shall be as shown below.

a) Attendance 5 marks
b) Record 5 marks
c) Regularity consistency 5 marks
d) Performance 5 marks

**Scheme for the Evaluation of Practical Examination**

Weightage may be assigned for various components as follows

**A. For Qualitative Analysis**

Step 1. Result & Conclusion
Step 2. Confirmatory test 1
Step 3. Confirmatory test 2
Step 4. Neatly written scheme of experiments used for arriving at the final conclusion

**B. For Quantitative Experiments**

Step 1. Result of the reported value (minimum error)
Step 2. Calculation, presentation of the result (Graph)
Step 3. Procedure
Step 4. Skill

**PROJECT**

Components required:

(a) Institutional visit (compulsory) + report
(b) Project work (lab work)
(c) Report of the project work done
(d) Viva voce of the work

**Scheme for the Evaluation of Project**

Weightage may be assigned for various components as follows

1. Rationale of the study
   General background of the study
   Relevance of the study
2. Objective & scope of the study
3. Methodology- Appropriateness & Accuracy
4. Results & Discussion
   Presentation (figures, graphs, legends etc.) Analysis
   Relevance/ importance
5. References/literature up to latest reports & documentation
6. Conclusions
7. General presentation
   - Free of typographic errors
   - Free of redundant material

First Semester
Code: IM 1121
Foundation course I – Core related

Fundamentals of Biochemistry

Credits: 3
No. of contact hours: 54hrs
(3 hrs/wk)

Objective: To provide comprehensive information on fundamentals of Biochemistry, to provide an in-depth understanding on the origin and history of biochemistry. It also provides a perspective of research methodology and familiarizes the student with the varied branches of biochemistry, bioinformatics and biostatistics.

Module I
(8 hours)

History of biochemistry; Contributions of several scientists to biochemistry-, Francis Crick, James Watson, Frederick Sanger and Arthur Kornberg – their discoveries and the classical experiments associated with them.

Types of knowledge: Practical, Theoretical and Scientific Knowledge. What is Science; laws of science, basis of scientific laws and factual truths. Hypotheses: Formulation of hypothesis; hypothetico-deductive model, inductive model.

Core Text:
- A history of the Life Sciences: Magner L N 2nd edition, Marcel Dekker, Inc

Module II
(8 hours)

Carbohydrates

Classification of carbohydrates, ketoses and aldoses C3 to C6 series exemplified by one in each group (structure only), reactions and structure of glucose, fructose, sucrose, maltose and lactose. Mutarotation-Inversion of cane sugar. glycosides, polysaccharides- starch, cellulose, and glycogen – important structural features. General reactions of carbohydrates-oxidation, reduction, osazone formation. Mucopolysaccharides chondroitin sulphates, Heparin, Hyaluronic acid.


Module III
(8 hours) Lipids

Classification of lipids, classification of fatty acids, Emulsification- Saponification- Glycerides. Phospholipids- lecithin, cephalins, plasmalogens, phosphatidyl inositides (indicate structure and function), cerebrosides, gangliosides, saponification number and acid number, iodine value, sterols-cholesterol-structure and two color reactions. Bile acids.
Module IV Amino acids and Nucleic Acids (10 hours)

Classification of amino acids, abbreviated names of amino acids (one letter, three letter), optical activity, UV absorption, zwitter ion and titration of amino acid, general reactions of amino acids – ninhydrin reaction, formol titration, van slyke method, transamination. Purines, Pyrimidines, ribose, deoxyribose, nucleoside structure, nucleotide structure, different types RNA - mRNA, tRNA and rRNA - basic structural features, Action of DNAase, RNAase, secondary and tertiary structure of DNA, Watson and crick double helix model of DNA.

Module V (10 hours) Bioinformatics

Overview of information technology: -Overview of operating system and major applications of software. Academic search techniques –, plagiarism - Introduction to use of IT in teaching and learning. Power point features and slide preparation.

Introduction, importance and scope of bioinformatics, internet concepts (PubMed). Introduction to data mining and data analysis methods. Applications of sequence searching tools- BLAST, Clustal X, RASMOL-Elementary study of databanks- Genbank, EMBL, PDB,

CoreText:


Module VI (10 hours) Statistics

Significance of statistical methods in biological investigations, Introduction to statistical software SPSS-Probability theory, random variables. Basic idea about regression and correlation analysis. student’s t-test, Chi-square(X2 ). Correlation coefficient Data presentation- tables, histograms and pi diagrams.

(Study of the statistical terms and methods expected only in the biological perspective)

CoreText:


Suggested reading:-

Core Practicals

No. of contact hours: 36 hrs. (2 hrs/wk)

Familiarisation with biochemistry laboratory

Reactions of Aminoacids- Tyrosine, Tryptophan, Methionine, Proline, Arginine, Cysteine, Cystine, Histidine.

Second Semester

Code: IM 1241
Core Course-I

Environmental Studies

Total teaching hours: 54

Credits 4

3 hrs/wk

Scope of the Course

The need for sustainable development is a key to the future of mankind. This course is designed to give a clear understanding of environmental concerns and to follow sustainable development practices.

Module I (10 hrs)

The multi disciplinary nature of environmental studies. Definition, Scope and importance, Need for public awareness.

Natural Resources: Renewable resources and non renewable sources. Natural resources and associated problems-

(a) Forest resources: Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

(b) Water resources- use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam benefits and problems.

(c) Mineral resources: Use and exploitation environmental effects of extracting and using mineral resources, case studies.

(d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Case studies.

(e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
(f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable life-styles.

Module 11 - Ecosystems


Introduction types, characteristic features, structure and function of the following ecosystem- (a) Forest ecosystem, (b) grassland ecosystem, (c) desert ecosystem and (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Module 111 - Biodiversity and its conservation

- Introduction- Definition: genetic, species and ecosystem diversity.
- Biogeographical classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, national and local levels.
- India is a mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity: habitat less, poaching of wildlife, man wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of biodiversity; In-situ and ex-situ conservation of biodiversity.

Module IV - Environmental pollution

- Definition

- Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards.
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: floods earthquake, cyclone and landslides.

Module V - Social issues and the environment

- From unsustainable to sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people, its problems and concerns. Case studies
- Environmental ethics issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Waste land reclamation.
- Consumerism and waste products.
- Environment protection act.
Air (Prevention and control of pollution) Act
Water (Prevention and control of pollution) Act
Wildlife Protection Act.
Forest Conservation Act
Issues involved in enforcement of environmental legislation.
Public awareness.

Module VI- (8 hrs)

Human population and environment (3 hrs)
Population growth variation among nations.
Population explosion -Family welfare Programme.
Environment and human health.
Human Rights.
Value education.
HIV/AIDS.
Women and child welfare.
Role of Information Technology on Environment and human health.
Case Studies.

Field Work (5 hrs)
Visit to a local area to document environmental assets - river/forest/grassland/ hill/mountain.
Visit to a local polluted site - Urban/Rural/Industrial/ Agricultural.
Study of common plants, insects, birds.
Study of simple ecosystems - pond, river, hill slopes etc. (Field work equal to 5 lecture hours)

References
Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad - 380 013, India, Email: mapin@icenet.net (R)
Clark RS., Marine Pollution, Clanderson Press Oxford (TB)
De A.K., Environmental Chemistry, Wiley Eastern Ltd.
Down to Earth, Centre for Science and Environment (R)
Hawkins RE., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
Mhaskar A.K, Matter Hazardous, Techno-Science Publication (TB)
Qualitative Analysis of any one of the given unknown aminoacid

Tyrosine, Tryptophan, Methionine, Proline, Arginine, Cysteine, Cystine, Histidine.

The student should have done and recorded at least seven amino acids from the above list. The practical exam of 3 hrs duration consists of identification of any one of the given unknown amino acid from the above list.

References

- Analytical Techniques in Biochemistry and Molecular Biology- By Rajan Katoch.Springer Publishers

Third Semester

METHODS IN BIOCHEMISTRY

Credits: 4

No. of contact hours : 54 hrs.
3hrs/wk

Scope of the course

Advances in biochemistry are based on the careful design execution and data analysis of experiments designed to address specific questions or hypotheses. Biochemical experiments usually have much experimental
detail in common. The aim of this course is to address many of these common experimental techniques. A thorough learning of this course will enable one to independently understand, design and carry out scientific experiments.

Module I Centrifugation (16 hours)

Centrifugation-principle of sedimentation technique. Principle, procedure (only elementary details) and application of differential centrifugation, density gradient centrifugation, ultra centrifugation. Cell disruption techniques. Subcellular fractionation.


Module II (12 hours)
Electrophoretic and Chromatographic techniques

PAGE, SDS-PAGE, agarose gel electrophoresis-separation of proteins and nucleic acids, staining and molecular weight determination.

Principle, procedure (only elementary details) and applications of Paper chromatography, TLC, ion exchange chromatography, gel filtration, affinity chromatography.


Module III (6 hours)
Colorimetry and spectrophotometry

Principles and applications of colorimetry, spectrophotometry -Beer Lamberts law-Limitations-calculation of molar extinction co-efficient.


Module IV (8 hours)
Principles of radioactivity and blotting techniques

Principles of radioactivity- types and properties of α, β and γ-rays. Technique of autoradiography. Basic principle and applications of blotting techniques-western, northern and southern blotting.


Module V (8 hours)
Peptides


Module VI (12 hrs)
Protein chemistry

Classification, physical properties, solubility, isoelectric Point, protein denaturation, isoelectric precipitation, salt effect, heavy metal precipitation.- Structure of proteins-primary, secondary, tertiary and quaternary-force stabilizing each level of structure.
Determination of primary structure, N-terminal and C-terminal residues (one method each). Sequence of amino acid in polypeptide, digestion by enzyme (chymotrypsin & trypsin) oligopeptide separation and overlapping of amino acid.

References

- Analytical Techniques in Biochemistry and Molecular Biology- By Rajan Katoch. Springer Publishers
- Instrumental Methods of analysis- Chatwal, Anand.
- Manuals of biochemistry- Satya narayana.
- Principles and techniques of practical biochemistry- Bryan L. Williams and Keith Wilson.
- Basic Techniques In Biochemistry And Molecular Biology By R. K. Sharma, S. P. S. Sangha

Core Practicals

No. of contact hours: 54 hrs

Study of the general reactions of Carbohydrates

Glucose, Fructose, Galactose, Xylose, Sucrose, Lactose, maltose, Starch.

Molisch’s test, Benedict’s test, Fehling’s test, Barfoed’s test, Bial’s test, Phloroglucinol test, Hydrolysis test, Iodine test, Seliwanoff’s test, Foulger’s test, Osazone test.

Reference:


Fourth Semester

Code: IM 1441

CORE COURSE III

Physiological aspects of Biochemistry

Credits: 4

No. of contact hours: 54 hrs 3 hrs/wk

Scope and Objective

Science of Physiology is the study of functions in living organisms. More recently, this field has proceeded apace, and biochemists have been really successful in learning the impeccable working of the body systems at a finer level. A thorough learning of Physiological Biochemistry will help the students understand themselves more, and to build up their own living standards.
Module I: Digestion, Absorption and nutrition (9 hours)

Digestion and absorption of carbohydrates, proteins and lipids. role of bile in lipid digestion and absorption. Defects in digestion and absorption.

Fundamentals of nutritional biochemistry

Nutrition: Calorific value. BMR Fat and water soluble vitamins. Functions and deficiency Diseases(Structure of vitamins not needed). Co-enzyme form of the vitamins and their functions.


Module II: Biochemistry of Blood (9 hours)

 Constituents of Blood, types of blood cells, components of plasma, types of plasma proteins and functions. Mechanism of blood clotting (Extrinsic and Intrinsic pathway). Structure of hemoglobin.-Types of hemoglobin, sickle cell anemia.


Module III: Biochemistry of Respiration and Renal function (9 hours)

Transport of oxygen and carbon dioxide in blood, oxygen dissociation curve and Bohr Effect, Carbonic anhydrase, Chloride shift. Structure of nephron, Mechanism of formation of Urine. Basic principles of acidosis and alkalosis-metabolic and respiratory.


Module IV: Biochemistry of specialized tissue (9 hours)

Muscle proteins, Organization of Contractile proteins and mechanism of muscle contraction.- Sliding filament theory. Sources of energy for muscle contraction.

Nerve: Structure of Neuron, Mechanism of nerve impulse transmission.


Module V: Endocrinology (9 hours)

Important functions of the following hormones.: -Thyroxin. GH, TSH, LH and FSH hormones. ADH and oxytocin. Cortisol, cortisone, corticosterone (mineralocorticoids), aldosterone (glucocorticoid). epinephrine and nor-epinephrine. Sex hormones- Testosterone, estrone and estrasdiol. (Structures of hormones in the above-mentioned list are not expected.)Salient features and the endocrine defect associated with the following disorders- Addisons disease, Cushings syndrome,Diabetes Mellitus, Goitre, Hypothyroidism and Hyperthyroidism, Hashimotos thyroiditis, Diabetes Insipidius, Acromegaly.


Module VI: Enzymes (9 hours)

Introduction to enzymes, apoenzyme, holoenzyme, prosthetic group, classification of enzymes, lock and key model, induced fit model, active site, enzyme specificity and types. Enzyme kinetics, factors affecting the velocity of enzyme action. Enzyme concentration, temperature, pH, substrate concentration. Derivation of MM equation and Km Value determination, its significance. LB plot, Enzyme inhibition, reversible and irreversible, competitive, non-competitive and uncompetitive inhibition, allosteric enzymes. Isoenzymes, Zymogen form of enzyme and its activation.
References:

2. Medical Biochemistry – Vasudevan and Sreekumari
4. Human Physiology – Chatterjee, Medical allied agency

**Code: IM 1442**

Core course IV

Qualitative Analysis of carbohydrates

(Practicals)

Credits: 3

No. of contact hours: 54 hrs. (3 hrs/wk)

Qualitative analysis of any one of the given carbohydrate

Glucose, Fructose, sucrose, galactose, xylose, maltose, lactose, starch

The student should have done all the above experiments.

The practical exam will be of three hours duration and involves identification of the given carbohydrate from the above list.

References


**Fifth Semester**

**Code: IM 1541**

Core course VI

Metabolism-I

Credits: 3

No. of contact hours: 36 hrs. 2 hrs/wk.

Scope of the course

Life is a biochemical process involving thousands of reactions occurring in an organized manner. These reactions are collectively called metabolism. The major objective of learning this course is the complete understanding of all the metabolic reactions at a molecular level. This course is related to almost all the life sciences and without a background knowledge of this course, a thorough understanding of health and well-being is not possible.
Module I (10 hrs)

Glucose metabolism

Reactions and energetics of glycolysis (aerobic and anaerobic), galactose & fructose metabolism, oxidative decarboxylation- TCA cycle, anaplerotic reaction, gluconeogenesis, HMP shunt, galactosemia, fructosuria, essential pentosuria

Core Text:

Module II Glycogen Metabolism (4 hrs)

Glycogen Metabolism: Glycogenesis, glycogenolysis, Regulation of glycogen metabolism. Cori cycle, Brief study of the Glycogen storage diseases (Von Gierke, Pompes, Cori’s or Forbe’s, Anderson, Her’s, McArdle, Tarui’s).

Core Text:

Module III Fatty acid metabolism (8 hrs)

Transport of fatty acid in to mitochondria, Carnitine shuttle: α, β, ω oxidation of saturated, monounsaturated and polyunsaturated fatty acid, Refsum’s disease, sources of acetyl Co A, Biosynthesis of saturated fatty acid.

Core Text:

Module IV Lipid Metabolism (8 hrs)


Core Text:

Module V Steroid metabolism (6 hrs)

Biosynthesis of cholesterol. Formation of sex hormones and bile acids from cholesterol. Regulation of cholesterol biosynthesis. Brief idea about prostaglandins.

Core Text:
Module I

Nitrogen assimilation: conversion of nitrate to ammonia by plants, biological nitrogen fixation (symbiotic, non-symbiotic) Nitrogen balance (positive, negative).

Core Text:

Module II

General reactions of amino acid metabolism: transamination, transdeamination, oxidative deamination and decarboxylation, Urea cycle and regulation, glucogenic and ketogenic amino acids, biosynthesis and degradation of glycine, phenyl alanine. Alkaptonuria, phenylketonuria.

Core Text:

Module III

Nucleic acid metabolism: Sources of atoms of purines and pyrimidines, Biosynthesis and degradation of purines and pyrimidines- de novo and salvage pathways with regulation, Biosynthesis of adenylic acid, ATP and Uridylic acid (Outline pathway). gout, Lesch Nyhan syndrome

Core Text:

Module IV

Electron Transport Chain: Structure of mitochondria, sequence of electron carriers: NADH dehydrogenase, Succinate dehydrogenase, cytochrome reductase and cytochrome oxidase (outline of electron transport chain), sites of ATP synthesis, inhibitors of electron transport chain.

Core Text:
Module V

Oxidative phosphorylation: Sites of ATP production, hypothesis of mitochondrial oxidative
Phosphorylation-Chemiosmotic theory, P/O ratio, inhibitors and uncouplers, transport of reducing
potentials into mitochondria-Malate aspartate and glycerol-3-phosphate shuttle.

Core Text:
- Principles of biochemistry, by Albert Lehninger, David L Nelson, Michael M Cox, CBS Publishers &

Module VI Photosynthesis

Structure of chloroplast, light reaction, cyclic and noncyclic photophosphorylation, chlorophyll (structure
only), dark reaction, fixation of CO2 and formation of carbohydrate (brief treatment only), C3 and C4 plants,
photorespiration, CAM pathway.

Core Text:
- Principles of Biochemistry, by Albert Lehninger, David L Nelson, Michael M Cox, CBS Publishers &

Code: IM 1543

Core course VIII

Quantitative Analysis of Biomolecules

(Practicals)

Credits:3  No. of contact hours:108 hrs.

6 hrs/wk.

I  Quantitative Analysis

A. Estimation of Carbohydrates
   1. Estimation of glucose by Nelson-Somogyi method
   2. Estimation of glucose by anthrone method.
   3. Estimation of pentose by Orcinol method.

B. Estimation of Lipids
   Estimation of Cholesterol Zak’s method

C. Estimation of Aminoacids and Proteins
   1. Estimation of aminoacid by Ninhydrin method.
   2. Estimation of Protein by Biuret method.
   3. Estimation of Protein by Folin-Lowry method.

D. Estimation of Nucleic Acids
   1. Estimation of DNA by diphenylamine method.
   2. Estimation of RNA by Orcinol method
II Food analysis

1. Estimation of cholesterol in egg-Zak’s method
2. Estimation of reducing sugar in honey-Roe & Pappadopoulos method

The student should have done and recorded a minimum of eight experiments from the quantitative analysis section and two experiments from the food analysis section.

The core practical exam will be of three hours duration and involves colorimetric estimation of a biomolecule by the graphical method (from the above list of experiments)

References


OPEN COURSE

The open course is to be studied by students from other departments of the college and will be handled by core (biochemistry) faculty. The department can choose any one of the open course available in the scheme-Either Clinical approach to life or Life style diseases.

Code: IM 1551.1

Open Course(Core): Clinical Approach to Life

Credits: 2
No. of Contact Hours: 54
3 hrs/wk

Objective: To provide layman knowledge to the students of common stream about the various biochemical tests done to determine disease conditions, and a general interpretation of lab results.

Note: This course is studied by students from other departments like music, Malayalam, Hindi etc. who may not even have studied biology at their higher secondary level. Hence only an introduction to the terms and their significance in everyday life is aimed at in the present course.

Course Outline Module I Blood

(8 hrs)

Components of blood and their function,– difference between plasma and serum. Blood groups, Rh factor, hemolytic disease of the new born, Basic idea about blood transfusion.

Module II Routine Blood Analysis

(10 hrs)

Clinical significance and normal values of glucose– (fasting blood sugar, random blood sugar, post prandial blood sugar,Hb1 Ac), total Protein, albumin, Urea, bilirubin, Cholesterol- HDL and LDL.(determination methods of these parameters not needed).
Module III  Hematology  

Normal values and and clinical significance of the routine hematological tests – RBC count, WBC count, ESR, PCV, hemoglobin concentration, platelet count, bleeding time, clotting time. (Detailed procedures not needed).

Module IV  Urine analysis  

Routine examination of urine- Name of the normal constituents- Names and clinical significance of the abnormal constituents-Glucose, ketone bodies, blood, protein, bile pigments- microbiological examination-casts, crystals, detection of infection.

Module V  Function tests  

Liver function tests- List the functions of liver. Serum bilirubin. Jaundice-Features Names of enzymes used for diagnosis of liver diseases-AST/ALT.

Renal function test- List the functions of kidney. Renal threshold. Clearance tests-urea and creatinine clearance., Dilution and concentration test.

Thyroid function test.-Significance of T3, T4 and TSH values. Definition of hypo-and hyper thyroidism.

Core Text:

Medical Laboratory Technology Volume I, Kanai. L. Mukharjee,

Medical Laboratory Technology-Ramnik Sood.


Suggested Readings:

• Medical Laboratory Technology (Volume, II& III) By Kanai. L. Mukharjee.


• Fundamentals of Biochemistry for Medical students Dr. Mrs. Ambika Shanmugam, Published by 12, III- Cross street, West C.I.T. Nagar, Madras; III Edition, 1977)

• Bauer J.D. Clinical Laboratory Methods, C.V. Mosby, St. Louis 1982.


Code: IM 1551.2

Open Course: Lifestyle Diseases  (Core)

No. of Credits: 2  
No. of Contact Hours: 54  
3 hrs/wk.

Objective: To create awareness among students about the various diseases which originate and which could be prevented by controlling the life style. The course also covers the general aspects of diagnosis, methods of prevention and pharmaceutical intervention.

Course Outline

Module I  
(9hrs)
Concept of lifestyle diseases- importance of lifestyle factors in preventing disease development, diet, exercise, smoking, alcohol etc.

Module II  
(9 hrs)
Diabetes- Type 1 and type2, characteristics, causes, diagnosis, prevention and management

Module III  
(9 hrs)
Cancer:
Characteristics, Causes, Diagnosis, Prevention, Management, familiarization with treatment modalities

Module IV  
(9 hrs)
Body mass index, determination and significance Obesity- factors leading to development, prevention, management.

Module V  
(6 hrs)
Atherosclerosis and cardiovascular diseases- Myocardial infarction, congestive heart failure, ischemic diseases-Causes, diagnosis and management.

Module VI  
(6 hrs)
Importance of diet and exercise in health- balanced diet, BMR, calorific value, How to reduce cholesterol and risk of heart attack through life style changes, use of life style medicine to treat disorders.

Reference :

Sixth semester
Code: IM 1641
Core course IX

CLINICAL BIOCHEMISTRY

Credits:3  
No. of contact hours:54 hrs.  
3 hrs/wk.

Scope
Clinical Biochemistry mainly deals with the biochemical aspects that are involved in several clinical conditions. The results of qualitative and quantitative analysis of body fluids assist the clinicians in the diagnosis, treatment, prevention of disease, drug monitoring, forensic investigation, tissue and organ transplantation.
Module I (6 hrs)

Sample collection and preservation methods of body fluids.

Collection and preservation procedures of blood, plasma, serum, and urine, preparation of swabs.

Module II Blood analysis (12 hrs)

Principle of estimation, normal values and clinical significance of the following parameters of blood: Glucose - fasting, random, post prandial, HbA1c - Glucose tolerance test, Hb, Uric acid, Lipid profile, triglycerides, total cholesterol, HDL cholesterol and LDL cholesterol, Urea, Acid phosphatase, Creatine phosphokinase. (Detailed determination procedures not needed).

Module III Haematology (10 hrs)

Principle of determination, clinical significance of the following parameters: Total count, differential count, erythrocyte sedimentation rate, packed cell volume, prothrombin time, bleeding time and clotting time. Brief study of blood groups - anticoagulants, storage and transfusion of blood, hemolytic disease of the newborn.

Module IV Organ function test (12 hrs)

Principles of the following tests of liver function and the interpretation of the results: total protein, total and conjugated bilirubin, jaundice - features - hemolytic and obstructive - AST, ALT, ALP,

Thyroid function test - T3, T4, TSH - determination of hypo- and hyperthyroidism. Primary and secondary.

Renal function test - Urea, creatinine, urea clearance test.

Module V Urine analysis (6 hrs)

Urine - Names of normal constituents. Abnormal constituents: ketone bodies, protein, glucose, blood, bile pigments - procedures of qualitative analysis and their clinical significance.

Module VI Life style disorders (8 hrs)

Introduction to life style disorders - definition, lifestyle factors in the development of diseases - Diabetes - Types, causes, diagnosis, prevention and management.

Cancer - a basic idea about the disease.

References


Scope of the course

Molecular biology is a new research field that is a result of traditional industrial microbiology and recombinant DNA technology. It is a revolutionary scientific discipline based on the ability of researchers in gene transfer. This very interesting course will definitely equip the students to surf the world of genetic engineering and genetic manipulations.

Module I: Introduction to Molecular Biology  
(Classical experiments proving DNA as the genetic material- transformation experiments, Hershey Chase experiment, Central dogma of molecular biology, Concept of gene- Split genes- introns and exons. C-value paradox.  

Module II: Replication  

Module III: Transcription  
(Prokaryotic Transcription- process-Initiation, elongation and termination, different forms of RNA- mRNA, tRNA, rRNA. Prokaryotic RNA polymerase-promoters and enhancers. Definition of splicing.  

Module IV: Genetic code and translation  
(Salient features of genetic code, codons, anticodons, recognition, Prokaryotic translation- aminoacid activation, initiation, elongation and termination- inhibitors of protein synthesis. Definition of protein folding and chaperones.  
MODULE V: Regulation and expression in prokaryotes (6 hours)

Constitutive and inducible enzymes, operon concept Brief study about lactose operon and tryptophan operon- Positive and negative regulation of lactose operon.


MODULE VI: Recombinant DNA technology (12 hours)

Outline study of recombinant DNA technology- vectors, cosmid, plasmid, phage, restriction enzyme, palindromes, reverse transcriptase, construction of genome library, cloning, identification of clones, fingerprinting, DNA sequencing- Maxam Gilbert sequencing, Sanger’s method, an introduction to PCR and RFLP.

REFERENCES:


Code: IM 1643

Core course XI (Practicals)

Credits: 3 No. of contact hours: 72hrs

4 hrs/wk

Urine analysis and Hematology

Qualitative tests of urine: Abnormal constituents

- Proteins (Coagulation test, sulfosalicylic acid test,)
- Sugars (Benedicts test)
- Hemoglobin (Benzidine test)
- Ketone bodies (Rothera test, Gerhardt’s test)
- Bile pigments (Fouchet’s test, Gmelin’s test)
- Bile salts (Hay’s test)
**Hematology**

ESR, PCV, TC/DC count, Blood Grouping, Hemoglobin

The student should have done a minimum of five abnormal constituents in urine analysis and four hematology experiments. The core practical exam will be of three hours duration and involves identification of an abnormal constituent in the given urine sample and a hematology experiment from the above list.

**References**


**Code: IM 1644**

**Core course XII (Practicals)**

**Credits: 3**

**No. of contact hours: 72hrs**

**4 hrs/wk**

**Serum estimation**

1. Estimation of blood glucose by Nelson – Somogyi Method
2. Estimation of serum Cholesterol by Zak’s Method
3. Estimation of blood Urea by Diacetylmonoxime Method
4. Estimation of Total Protein in serum by Biuret Method
5. Estimation of total protein in serum by Folin-Lowry method
6. Estimation of Uric acid in serum using Phosphotungstic acid reagent
7. Estimation of inorganic phosphate in serum by Fiske-Subbarao Method
8. Estimation of serum Bilirubin

**Clinical Enzymology:**

10. Assay of serum alkaline phosphatase
11. Assay of Serum alanine amino transferases (ALT/SGPT)
12. Assay of serum aspartate amino transferases (AST/SGOT)

The student should have done and recorded a minimum of seven experiments from the above list. The core practical exam will be of three hours duration and involves estimation of a biomolecule in the given serum/blood sample.

**References**

IM 1645 Project
Credits: 4

Contact hours: 36 hours (2 hrs/wk) 1 hr/wk for core and 1 hr/wk for vocational

The students should do one project either in Biochemistry or Microbiology. The total number of students in the program should be equally divided into two batches and one batch should do a project in core subject and the other batch should do the project in the vocational subject. Which batch would come under which faculty can be decided by drawing lots.

The project report should be based on a mini-project work done by the students. This should include original laboratory work, analysis of results and should be presented along with relevant and current literature review. The evaluation of dissertation should be done on the basis of evaluation of the project report and a viva-voce examination of the student. The students will do the project in the fifth semester and have to submit their reports in the sixth semester.

A report of the industrial visit carried out to any industries/institutions relevant to the subject should accompany the project report.

**Scheme for evaluation of project**

<table>
<thead>
<tr>
<th>Component</th>
<th>Weightage</th>
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</thead>
<tbody>
<tr>
<td>Total weightage</td>
<td>30</td>
</tr>
<tr>
<td>Project</td>
<td>20</td>
</tr>
<tr>
<td>Industrial Visit</td>
<td>10 (The visit carries a weightage of 6 and the visit report carries a weightage of 4)</td>
</tr>
</tbody>
</table>
Scheme and syllabus of Industrial Microbiology for

Career related First Degree programme in

“BIOCHEMISTRY AND INDUSTRIAL MICROBIOLOGY” Under CBCSS
SEMESTER I CODE: IM1171

VOCATIONAL COURSE I Fundamentals of Microbiology

Total Hrs-54 CREDITS -4 (3Hrs/week)

MODULE I

(9 Hrs)

MODULE II

(9 Hrs)
Microscopy- Principles & uses of bright field, dark field, phase contrast, fluorescent, electron microscopy (TEM & SEM). Principles of staining of bacteria—simple staining, Negative staining, Gram’s staining, Acid fast staining (Ziehl Neelsen staining), spore staining & staining of metachromatic granules.

MODULE III

(9 Hrs)
Morphology and anatomy of bacterial cell—Cell size, shape, arrangement. Structure of Prokaryotic plasma membrane, cell wall, capsule, slime layer, S-layer, flagella, pili, nucleoid, inclusion bodies, endospore.
MODULE IV (9 Hrs)


MODULE V (9 Hrs)

Sterilization (physical and chemical methods)-Sterilization by heat (Moist heat, dry heat and incineration), radiation (ionizing radiations and Ultraviolet rays), aldehydes and disinfectants. Factors influencing sterilization.

MODULE VI (9 Hrs)


REFERENCES

3. Microbiology-Bernard D Davis
4. Foundations in Microbiology-Talaro and Talaro
5. Essentials of Microbiology (Sixth edition) - Purohit and Singh (ISBN 81-85031-67-3)

SEMESTER I

VOCATIONAL PRACTICAL

Total Hrs-36 CREDIT-0 (2Hrs /week) Part I (18 Hrs)

1. Laboratory precautions- General rules and regulations.
2. Common instruments in Microbiology laboratory.
3. Cleaning and sterilization of glass wares.
4. Preparation of media.
5. Isolation of pure culture - Isolation of bacteria by pour plate, streak plate and spread plate methods.
6. Cultural characteristics of Microorganisms - Colony morphology on culture plate.

Part II (18 Hrs)

7. Study of the various components of the microscope, its handling and maintenance.
8. Preparation of bacterial smear
9. Staining of bacteria:
   (a) Simple staining of bacteria,   (b) Gram staining,
   (c) Negative staining,   (d) Spore staining,
   (e) Volutin granule staining
10. Motility of bacteria by hanging drop method.
11. Lactophenol cotton blue mounting of fungi and study of fungal microscopic characteristics.
REFERENCES
3. Experiments in Microbiology Plant Pathology and Biotechnology- K. R. Aneja

SEMESTER II
CODE: IM 1222
FOUNDATION COURSE II
Microbial Taxonomy and Physiology

Total Hrs-54 CREDITS-3 (3 Hrs /week)

MODULE I (12 Hrs)


MODULE II (10 Hrs)

Classification of fungi-with examples (brief account only). Classification of algae-green algae, brown algae and diatoms with examples.Classification of protozoa- flagellates, Amoebas, sporozoa and ciliates—(brief account) with examples.

MODULE III (10 Hrs)

Bacterial growth- Binary fission, Bacterial growth curve, factors affecting bacterial growth. Significance of various phases of growth. Batch, continuous culture, Fed batch, Synchronous growth.

MODULE IV (12 Hrs)

Bacterial Photosynthesis -: oxygenic and anoxygenic types, Nitrogen fixation: Symbiotic and non-symbiotic types.

MODULE V (10 Hrs)


REFERENCES
3. Essentials of Microbiology-Purohit and Singh
4. Brock’s Biology of Microorganisms-Mardigon Martinko And Parker
5. Microbial Genetics-Frifielder
6. Microbiology-Zins
SEMMESTER II
CODE: IM1271

VOCATIONAL COURSE II
Microbiology Practical

Total Hrs-36 CREDITS-3 (2Hrs/week)

Part I (18 Hrs)
1. Isolation and enumeration of bacteria from soil.
2. Isolation and enumeration of bacteria from Water.
3. Isolation and enumeration of bacteria from Air.
4. Biochemical tests-
   (a) IMViC
   (b) Sugar fermentation
   (c) Urease test
   (d) TSI
   (e) Catalase and Oxidase

Part II (18 Hrs)
5. Candle jar method for cultivation of anaerobic bacteria.
6. Slide culture technique for fungi
9. Effect of different disinfectants and antiseptics on bacteria.

REFERENCES
2. Microbiology A Laboratory Manual - James G Cappucino Natalie Sherman
3. Experiments In Microbiology Plant Pathology And Biotechnology- K.R Aneja

SEMMESTER III
CODE: IM1371

VOCATIONAL COURSE III CELL BIOLOGY

Total Hrs-72 CREDITS -3 (4 Hrs/week)

MODULE I (12 Hrs)

**MODULE II**

(12 Hrs)


**MODULE III**

(12 Hrs)

Cell-cell interactions, cell-matrix interactions, cell-cell adhesion, cell-cell signaling, Role of bacterial cell-cell signaling in virulence and pathogenesis.

**MODULE IV**

(12 Hrs)


**MODULE V**

(12 Hrs)


**MODULE VI**

(12 Hrs)


**REFERENCES**

2. Principles of Genetics by D. Peter Snustad and Michael J Simmons, John Wiley & Son,
4. Cell and Molecular Biology by De Robertis & De Robertis,jr.

**SEMESTER III**

**CODE: IM1372**

**VOCATIONAL COURSE IV**

**Microbial Genetics and Biotechnology**

**Total Hrs-54 CREDITS -3**

(3 Hrs /week)

**Module I**

(9 Hrs)

Introduction to history of genetics, Mendel’s laws of genetics, alleles, multiple alleles, Test cross and back cross. Basic idea about linkage and crossing over, Mapping. Sex linked inheritance, (simple numerical problems to be worked out) A brief idea about population genetics-Hardy Weinberg law.
Module II. (9 Hrs)

Prokaryotic replication & its types: ô- Theta mode and ô-sigma mode or rolling circle model of replications. Different method used for introducing foreign DNA into the cell: DNA direct transformation, electroporation, Microinjection and biolistic methods.

Module III (9 Hrs)

Gene transfer mechanisms- Transformation, conjugation and transduction- generalized and specialized transduction. Ames test & its significance

Module IV (9 Hrs)

Animal cell tissue culture- Preparation of culture media, primary culture, cell lines & its types. Maintenance of cell lines. Genetically modified organisms. Transgenic animals – engineering embryos (brief account only).

Module V (9 Hrs)

Plant cell tissue culture- Media composition. Plant tissue culture techniques- callus culture, cell suspension culture, protoplast culture and somatic hybridization. Applications of plant tissue culture, Transgenic plants- improving crops and foods (brief account only).

Module VI (9 Hrs)


Reference:


SEMESTER III

VOCATIONAL PRACTICAL

Total Hrs 36 CREDITS-0 (2 Hrs /week)

Part I (18 Hrs)

1. Isolation of antibiotic resistant bacterial population by gradient plate method.
2. Isolation of streptomycin resistant mutant by replica plate technique.
3. Isolation of plasmid DNA.
4. Preparation of genomic DNA from bacteria.
5. Principle and application of agarose gel electrophoresis
Part II (18 Hrs)

6. Plant regeneration from callus or plant tissue.
7. Mushroom cultivation
8. Bioassay for evaluating the mutagen or carcinogen by Ames test.
10. Demonstration of Bacterial transformation.

REFERENCES

3. Experiments in Microbiology plant pathology and Biotechnology- K.R.Aneja

SEMESTER IV CODE: IM1471

VOCATIONAL COURSE V
Environmental Microbiology

Total Hrs 54 CREDITS-3 (3 Hrs /week)

MODULE I (9 Hrs)

Microbial ecology-interactions. Microorganisms as components of ecosystem-as producers and decomposers. Bacterial life in extreme environments & effect of temperature, pH, pressure, salt and heavy metals.

MODULE II (9 Hrs)


MODULE III (9 Hrs)

Bioremediation: Degradation of pesticides, detergents, degradation of lignin, xenobiotic compounds, petroleum and hydrocarbon compounds. Microbes in mining. Bacterial leaching.

MODULE IV (9 Hrs)


MODULE V (9 Hrs)

MODULE VI

Plant pathology- Symptoms, etiology, epidemiology and management of the following plant diseases: mosaic disease of tobacco, bunchy top of banana, bacterial blight of paddy, damping off of tobacco, blight of maize/sorghum, leaf spot of paddy and citrus canker.

REFERENCES

2. Environmental Microbiology- K. Vijaya Ramesh (ISBN 81-8094-003-9)
5. Introduction to Soil Microbiology – Alexander
6. Soil Microbiology-Waksman
7. Soil Microorganisms And Its Growth-N.S. Subba Rao
8. Biofertilizers in Agriculture- Subha Rao

SEMESTER IV

CODE: IM1472

VOCATIONAL COURSE VI

Food Microbiology

Total Hrs 54 CREDITS-2

Module I

Introduction: Importance of food and dairy Microbiology – Types of microorganisms in food – Source of contamination (primary sources) – Factors influencing microbial growth in foods (extrinsic and intrinsic)

Module II

Fermented food: Cheese, bread, wine, fermented vegetables – methods and organisms used. Food and enzymes from microorganisms – single cell protein, production of enzymes.

Module III


Module IV

Food Poisoning: food borne infections and intoxications: Source, symptoms and Management of the following- (a) Bacterial (Staphylococcal, Brucella, Clostridium, Escherichia, Salmonella) (b) Fungal : Mycotoxins,(c) Viral: Hepatitis, (d) Protozoa – Amoebiasis. Management

Module V

REFERENCES


SEMESTER IV

CODE: IM 1473

VOCATIONAL COURSE VII  Microbiology Practical

Total Hrs 54 CREDITS-3 (3 Hrs/week) (27 Hrs)

Part I

1. Determination of Biochemical oxygen Demand (BOD) of water.
2. Determination of Chemical oxygen Demand (COD) of water.
   (a. Presumptive coliform test, b. Confirmed coliform test, c. Completed coliform test)
4. Isolation & culturing of *Rhizobium* from root nodules of higher plants.
5. Study of the following disease
   (a) Tobacco mosaic disease, (b) Bacterial blight of paddy, (c) Leaf spot of mulberry, paddy, (d) Bunchy top of banana, (e) Citrus canker

Part II

7. Determination of quality of a milk sample by MBRT, phosphatase test.
8. Determination of TDT and TDP
10. Effect of salt concentrations on bacterial growth.
11. Microbiological examination of foods-
    (a) Isolation and enumeration of bacteria and fungi from spoiled vegetables,
    (b) Isolation and enumeration of bacteria and fungi from spoiled fruits
    (c) Isolation and enumeration of bacteria and fungi from Spoiled fish or meat.
    (d) Isolation and enumeration of bacteria and fungi from soft drinks.

REFERENCES

1. Experiments in Microbiology, Plant pathology and Biotechnology- K. R. Aneja
2. Practical Microbiology- R C Dubey and D K Maheswari.
SEMESTER V
CODE: IM1571

VOCATIONAL COURSE VIII Fermentation Technology

Total Hrs 72 CREDITS-3

(4 Hrs /week)

MODULE I

Fermentation technology-isolation, screening and strain improvement of industrially important microorganisms. Introduction to fermentation processes- media for industrial fermentation, sterilization, inoculum preparation.

MODULE II

Design and parts of fermenter – agitation, aeration, pH, temperature, dissolved oxygen-control and monitoring, difference in fermentation process of biomass, chemicals and conversion products- comparative brief account. Cell and enzyme immobilization.

MODULE III

Recovery of fermentation product (Down-stream processing) - Methods for cell lysis, Physical separation, liquid extraction, Precipitation, chromatography, drying.

MODULE IV

Microbial products- raw materials, organism and industrial process involved in the production of penicillin, streptomycin, ethanol, butanol, acetone, vitamin B12, riboflavin, alpha lysine, amylase, protease, pectinase, citric acid. Biopesticide production.

MODULE V

Microbes in food industry- bacteria (lactics, acetics, proteolytic and lipolytic bacteria, Thermophillic and thermoduric bacteria, pigmented bacteria and coliform bacteria), molds (Mucor, rhizopus, penicillium, Aspergillus and yeasts (Genus Saccharomyces, zygosaccharomyces, Genus candida & salt tolerant yeast). Production of SCP.

MODULE VI

Fermentation - Bacteria grouped according to major products of glucose, dissimilation-Lactic acid fermentation, Homolactic fermentation, Heterolactic fermentation, Ethanolic fermentation, and propionic acid fermentation, mixed acid fermentation, Butanediol fermentation and butyric acid fermentation. Amino acid fermentation (stickland reaction). Pasteur effect.

REFERENCES

1. Industrial Microbiology - L.E. Casida,JR (ISBN 0 85226 1012)
5. Fermented foods Economic Microbiology Vol 7 rose A (ed)
6. Manual Of Industrial Microbiology And Biotechnology, Demin & Davis
7. Applied Microbiology-Musharraffulude
SEMESTER V
CODE: IM1572

VOCATIONAL COURSE IX  Microbiology Practical

Total Hrs 108 CREDITS-4  (6 Hrs /week)

Part I  (54 Hrs)

1. Yeast Cell immobilization
2. Isolation of amylase producers.
3. Demonstration of microbial antibiosis by crowded plate technique.
4. Production of wine from grapes.
5. Isolation of lipolytic microbes.
6. Isolation of protease producers.

Part II  (54 Hrs)

8. Citric acid production by Aspergillus sp..
9. Amylase production by SSF.
10. Enrichment of coir pith degraders.
11. Analysis of Mycotoxin (Aflatoxin) in fungus- contaminated food materials.
12. Demonstration of fermentation by yeast.

REFERENCES

1. Experiments in Microbiology plant pathology and Biotechnology - K. R. Aneja
2. Practical Microbiology-R C Dubey and D K Maheswari.

IM1645 PROJECT (Core/Vocational)

Credit 4  (1 Hr /week)

The students should do one project either in Biochemistry or Microbiology. The total number of students in the program should be equally divided into two batches and one batch should do a project in core subject and the other batch should do the project in the vocational subject. Which batch would come under which faculty can be decided by drawing lots.

The project report should be based on a mini-project work done by the students. This should include original laboratory work, analysis of results and should be presented along with relevant and current literature review. The evaluation of dissertation should be done on the basis of evaluation of the project report and a viva-voce examination of the student. The students will do the project in the fifth semester and have to submit their reports in the sixth semester.

A report of the industrial visit carried out to any industries/institutions relevant to the subject should accompany the project report.

Scheme for evaluation of project

<table>
<thead>
<tr>
<th>Component</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project</td>
<td>20</td>
</tr>
<tr>
<td>Industrial Visit</td>
<td>10</td>
</tr>
<tr>
<td>Total weightage</td>
<td>30</td>
</tr>
</tbody>
</table>

(The visit carries a weightage of 6 and the visit report carries a weightage of 4)
SEMESTER VI
CODE: IM1671

VOCATIONAL COURSE X Medical Microbiology

Total Hrs 54 CREDITS-3 (3 Hrs /week)

MODULE I (9 Hrs)

Normal Microbial flora- Resident flora and transient flora, Beneficial and harmful effects of normal flora. Brief account on normal flora of skin, conjunctiva, upper respiratory tract, mouth, teeth, stomach, upper and lower intestine, genitourinary tract. Nosocomial infection

MODULE II (9 Hrs)

Bacteriology: Pathogenicity, laboratory diagnosis, prevention and control of the diseases caused by (brief account only): Staphylococcus aureus, Streptococcus pyogenes, Neisseria gonorrhoeae, Escherichia coli, Salmonella typhi, Vibrio cholerae, Corynebacterium diphtheriae, Clostridium tetani, Mycobacterium tuberculosis, Treponema pallidum, Mycoplasma pneumoniae, & Chlamydia trachomatis.

MODULE III (9 Hrs)


MODULE IV (9 Hrs)

Virology: Airborne viral disease (Influenza, measles, mumps, rubella, small pox). Insect borne (yellow fever, dengue fever) food and water borne disease (polio). Direct contact diseases – Hepatitis B, rabies, AIDS.

MODULE V (9 Hrs)

Protozoology: Disease caused by Protozoa (Pathogenic mechanisms, Disease transmission and life cycle) – Plasmodia, Toxoplasma, Entamoeba histolytica, Trypanosoma.

MODULE VI (9 Hrs)


REFERENCES

1. Ananthanarayan and Panicker’s Textbook of Microbiology- ISBN 81 250 2808 0
2. Notes on Medical Bacteriology – J.Douglas SleighMorag C. Timbury
3. Parasitology – B. Dasgupta
4. Medical Mycology – Rippon
5. Principles of Bacteriology Virology and immunity Vol 4 Lopka and Wilson
6. Fundamentals of medical Virology by Kucera and Myrvik
SEMESTER VI
CODE: IM1672
VOCATIONAL COURSE – XI Microbiology Practical

Total Hrs 108 CREDITS-4 (6hrs/week)

Part I (54 Hrs)
1. Antibiotic sensitivity testing- Kirby-Bauer method
2. Determination of MIC and MBC of antibiotics
3. Identification of common bacterial pathogens by using morphological, cultural and biochemical characters.
   a) Staphylococcus
   b) Streptococcus
   c) Escherichia coli
   d) Pseudomonas
   e) Klebsiella
5. RPR card test for syphilis.

Part II (54 Hrs)
6. ASO latex agglutination test
7. RA latex agglutination test
8. HBs Ag detection by using immunochromatographic technique
10. Isolation of Enteric pathogens from stool by direct plating methods.

REFERENCES
2. Medical Laboratory technology – Methods and interpretation (ISBN 81-8448-449-6)

ELECTIVE COURSE
CODE: IM1661
ELECTIVE COURSE- IMMUNOLOGY

Total Hrs 36 CREDITS-2 (2 Hrs /week)

MODULE 1 (6 Hrs)


MODULE II (6 Hrs)

Antigens, structure and types of antigens-endogenous and exogenous, & super antigens. Antigenicity
and immunogenicity. Haptens, adjuvants and its types. Structure and functions of different classes of immunoglobulins (IgG, IgM, IgA, IgD & IgE)
MODULE III

Cells of immune system (Lymphocytes, Mononuclear cells, granulocytes, dendritic cells), Phagocytosis, Organs of immune system (primary and secondary lymphoid organs), Complement system and activation pathways (classical, alternate and lectin pathways), Membrane attack complex. Structure, and function of Major Histo compatibility complex (MHC class 1 and Class II)–brief introduction only.

MODULE IV

Brief introduction to antigen and antibody reactions- complement fixation, neutralization, agglutination reactions, precipitation reactions and its types. Immunoassays of diagnostic importance-ELISA, RIA, VDRL and WIDAL test. Western Blotting, Production of monoclonal and poly clonal antibodies, and its applications.

MODULE V

Brief account on Immunodeficiency disorders, Hypersensitivity reactions, Immunohaematology (Blood groups and Rh incompatibilities), Autoimmunity, Vaccines, Immunology of organ and tissue transplantation and Immunology of malignancy

REFERENCES

1. Immunology: An Introduction by Ian R Tizard (2006) Publisher: Cengage Learning
2. Immunology and Immunotechnology by Chakravarty (2006)
4. Elements of Immunology (2009) by Khan Publisher: Dorling Kindersley (India) Pvt
5. Immunology by K.R. Joshi (2007) Publisher: Agrobios (India)
6. Basic Immunology, 3ed by: Abbas Publisher: Elsevier
8. Immunology by David A. Marcus, Richard A. Goldsby, Barbara A. Osborne (2003) Publisher: WH. Freeman & Company
UNIVERSITY OF KERALA

Scheme and syllabus of Biochemistry

for

career related First degree programme in
Biochemistry (core)

and

Industrial Microbiology (vocational)

under

Choice Based Credit and Semester System

2015