Bharathiar University, Coimbatore-641046

B. Sc. Human Biology
(For the CPP/COP students admitted during the academic year 2015-16 and onwards)

Scheme of Examinations (CBCS Pattern)

<table>
<thead>
<tr>
<th>Part</th>
<th>Course Title</th>
<th>Ins. hrs/week</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>CIA</td>
</tr>
<tr>
<td>Semester - I</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Language - I</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>II</td>
<td>English - I</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>III</td>
<td>CORE I - Human Anatomy and Physiology - I</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>III</td>
<td>CORE II - Epidemiology for Medical and Health systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>III</td>
<td>ALLIED PAPER I - General Biology</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>IV</td>
<td>Environmental Studies #</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Semester - II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Language - II</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>II</td>
<td>English - II</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>III</td>
<td>CORE III - Human Anatomy and Physiology - II</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>III</td>
<td>CORE IV - Introduction to Genetics</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>III</td>
<td>ALLIED PAPER II - Basic Biophysics</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>IV</td>
<td>Value Education- Human rights #</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Semester - III</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>CORE V - Health Law and Ethics</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>III</td>
<td>CORE VI - Behavioral Sciences</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>III</td>
<td>CORE VII - Introduction to Histology</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>III</td>
<td>CORE VIII - Biostatistics</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>III</td>
<td>ALLIED PAPER III - General Chemistry - I</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>IV</td>
<td>Skill Based Subject I - Calculus</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td>Tamil @ / Advanced Tamil # (or) Non-Major Elective- I</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Yoga For Human Excellence) # / Women’s Rights # /</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constitution of India #</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Semester - IV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>CORE IX - Medical Communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>III</td>
<td>CORE X - Organic Chemistry</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>III</td>
<td>CORE XI - Diagnostic tools</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td>CORE XII - Hospital Allied Services</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>III</td>
<td>ALLIED PAPER IV - General Chemistry - II</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>IV</td>
<td>Skill Based Subject II - Introduction to Immunology</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td>Tamil @ / Advanced Tamil # (or) Non-Major Elective- II</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>General Awareness #</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>50</td>
</tr>
</tbody>
</table>
### SEMESTER – V

| III | CORE XIII - Introduction to Microbiology | 5 | 25 | 75 | 100 | 4 |
| III | CORE XIV - Hospital Information System  | 5 | 25 | 75 | 100 | 4 |
| III | CORE XV - Medical Records               | 5 | 20 | 55 | 75  | 3 |
| III | CORE XVI - General Pathology            | 5 | 25 | 75 | 100 | 4 |
| III | ELECTIVE - I                             | 5 | 25 | 75 | 100 | 4 |
| IV  | Skill Based Subject III - Introduction to Biochemistry | 5 | 20 | 55 | 75  | 3 |

### SEMESTER - VI

| III | CORE XVII - Entrepreneurial Microbiology  | 6 | 25 | 75 | 100 | 4 |
| III | CORE XVIII - Social and Preventive Medicine | 6 | 25 | 75 | 100 | 4 |
| III | CORE XIX - Introduction to Neurobiology   | 5 | 25 | 75 | 100 | 4 |
| III | ELECTIVE - II                            | 5 | 25 | 75 | 100 | 4 |
| III | ELECTIVE - III                           | 5 | 25 | 75 | 100 | 4 |
| IV  | Skill Based Subject IV –Basic Pharmacology| 3 | 20 | 55 | 75  | 3 |
| V   | Extension Activities - Community Work @   | - | 50 | -  | 50  | 2 |

**TOTAL**

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3500</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>140</td>
</tr>
</tbody>
</table>

List of Elective papers (Colleges can choose any one of the paper as electives)

<table>
<thead>
<tr>
<th>ELECTIVE - I</th>
<th>A</th>
<th>Hospital Function and Services - I</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Nano-materials and Nano-medicine</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELECTIVE - II</th>
<th>A</th>
<th>Hospital Function and Services - II</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Nutritional Biochemistry</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELECTIVE - III</th>
<th>A</th>
<th>Hospital Architecture and Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Sports Biochemistry</td>
</tr>
</tbody>
</table>

@NoUniversityExaminations.OnlyContinuousInternal Assessment(CIA)  
# NoContinuousInternal Assessment(CIA).OnlyUniversityExaminations  
* For Project work: 80% Marks & Viva voce: 20% Marks
Core I - HUMAN ANATOMY AND PHYSIOLOGY - I

UNIT I
Cell structure and function: membrane, cytoplasm, organelles, movement across borders, metabolism.

UNIT II
Anatomy and physiology of vision: Structure of eye, image formation and defects of the eye, Receptor mechanism of the eye, photo-pigments, Visual cycle and color adaptation.

UNIT III
Skeletal Muscle: Muscle and joint anatomy, structure of skeletal muscle, contraction of muscle fiber, chemical changes during muscle contraction, sources of energy of muscle contraction.

UNIT IV

UNIT V

REFERENCES
9. Gray’s Anatomy - The anatomical basis of clinical practices, Susan Stranding, 40th edition
10. Human Anatomy, B. D. Chaurasia (Vol 1, 2, 3)
Core II - EPIDEMIOLOGY FOR MEDICAL AND HEALTH SYSTEMS

UNIT I
Concept of health and diseases: Definition and dimensions of health, spectrum of health, determinants of health, Indicators of health. Concept of disease, concept of disease causation, natural history of disease, concept of disease control, levels of prevention, modes of disease intervention, Internal classification of disease.

UNIT II
Medical terminology: Roots, prefixes, suffixes, abbreviations and symbols, common roots: element referring to, usage and definition, common prefix and suffixes- common abbreviations: departments, time, general health care, roots of medication and laboratory symbols.

UNIT III
Principles of epidemiology and epidemiological methods: Definition and basic concepts of Epidemiology including epidemiological triad. Basic measurement in epidemiology including measures of mortality and morbidity, infectious disease epidemiology, investigation of an epidemic outbreak.

UNIT IV

UNIT V
Demography and family welfare: Demographic cycle, demographic trend in India, national population policy 2000, family planning / welfare concepts, contraceptive methods. National Family Planning Program.

REFERENCES
1. Preventive and Social Medicine – Park. K
4. Stedman’s Medical Dictionary
Allied Paper I - GENERAL BIOLOGY

UNIT I
Living things - attributes, interpretation of the scientific methods, Linnaean taxonomic categories, absolute truth in science; Atoms, molecules and life - components, periodic table, properties of water, pH and its significance in living things; Biological Molecules - four molecules and its monomers, functional groups

UNIT II
Cell membrane structure and function - plasma membrane and its protein components, fluid mosaic model, intercellular movement, osmosis, diffusion; Cell structure and function - cytoskeleton, different organelles and its function, cell - cell interaction;

UNIT III
Energy flow in the life of a cell - Laws of thermodynamics, energy and work, Glycolysis, Krebs cycle, cellular respiration, electron transport chain, chemiosmosis; Viruses, prokaryotes - components, pathogenic prokaryotes, virus and viral reproduction, viroids, prions and mechanism of disease;

UNIT IV
DNA - composition, structure, historical figures in the elucidation of DNA, DNA replication with its critical components; Gene expression and regulation - DNA and protein interrelation, transcription, translation, mutation, gene and protein regulation;

UNIT V
Cellular reproduction - binary fission, mitosis, meiosis, critical differences; Patterns of inheritance - Mendelian genetics, genetic principles; Principles of evolution - Pre-Darwinian concepts, Darwinian evolution, evidences, principles of population growth, population growth in developed vs. developing nations;

REFERENCES
Core III - HUMAN ANATOMY AND PHYSIOLOGY - II

UNIT I

UNIT II
Respiratory system: Anatomy of lungs and mediastinum, diffusion of gases in lungs, transport of oxygen from lungs to tissues through blood, factors influencing the transport of oxygen. Transport of CO2 from tissues to lungs through blood, factors influencing the transport of CO2.

UNIT III

UNIT IV
Endocrine system: Anatomy on location of endocrine organs, chemical nature of hormones, mechanism of action of hormones – intracellular receptor mechanism and second messenger mechanism (cAMP, cGMP, Ca- 2+) Structure function and deficiency symptoms of hormones of pituitary, thyroid, parathyroid and adrenal glands. Function of pancreatic hormones.

UNIT V
Male Reproductive system: Anatomy of male and female genital tract, structure of testis, Spermatogenesis, functions of testis. Female Reproductive system: Ovarian cycle, Structure and hormones of ovaries, menstrual cycle, menopause, pregnancy and lactation. Steroids as contraceptives

REFERENCES
8. Gray’s Anatomy - The anatomical basis of clinical practices, Susan Stranding, 40th edition
9. Human Anatomy, B. D. Chaursia (Vol 1, 2, 3)
Core IV - INTRODUCTION TO GENETICS

UNIT I
Concepts of classical genetics, Schaffner's theory, anti-reductionist consensus, molecular level of genetics. Mendelian principles, rules, concepts, dominant and recessive inheritance. Mutations and mechanisms of nuclear and extranuclear inheritance.

UNIT II
Population genetics - Hardy-Weinberg equilibrium, deriving genotypic and allelic frequency, genetic drift, Shift, components of a human pedigree, genetic counselling.

UNIT III
Cytogenetics - karyotypes, chromosomes and its anomalies, parts of chromosomes. mtDNA - endosymbiotic hypothesis, inheritance pattern, mtDNA mutation and disease

UNIT IV
Cancer genetics - cell growth, oncogenes, tumor suppressor genes, cancer genes in human genome, retroviral oncogenes.

UNIT V
Human genome project - history, goals, methods, results, interpretation. Reverse genetics - concepts, approaches.

REFERENCES
- Basic genetics by D.L.Hartl, 1991, Jones and Bartett public.
- Friedfelder 1987, Microbial genetics, Jones and Bartett public.
- Molecular Biology of the genes 4th Ed. Watson et.,al, the Benjamin /Cummings coins 1987
Allied Paper II - BASIC BIOPHYSICS

UNIT I
Mathematical models in mechanics: Different modelling assumptions. Kinematics of a particle moving in a straight line: Formulae for a particle moving in a straight line with constant acceleration, modelling an object moving vertically under gravity, speed-time/distance-time graphs.

UNIT II
Dynamics of a particle moving in a straight line: solving problems involving force and acceleration, resolving forces, frictional forces and coefficient of friction, inclined planes, connected particles, momentum and impulse, collisions, the principle of momentum conservation.

UNIT III
Statics of a particle: Particles in equilibrium, modelling additional forces, weight, tension, thrust, normal reaction and friction, solving static problems involving friction.

UNIT IV
Moments: Moment of a force acting on a body, sum of moments, bodies in equilibrium, non-uniform bodies.

UNIT V
Vectors: Displacement vector, representing vectors using line segments, using i,j notation, solving problems using vectors, velocity vector, using vectors to solve problems about forces.

REFERENCES
- BIOPHYSICS - Principles and Techniques, M.A. Subramanian – MJP Publishers - Chennai
- PRINCIPLES OF BIOPHYSICS, Dr.S.Palanichamy & Dr.M.Shanmugavelu.  Palani Paramount Publications - Palani
- Biophysics - Dr.S.Thiravia Raj - Saras Publications - Nagercoil
- Basic Biophysics for Biologist – M. Daniel -Agrobios (India) Jodhpur.
Core V - HEALTH LAWS AND ETHICS

UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V
Laws related to hospital finance: Securities and exchange board of India (SEBI)-securities contract regulation act – negotiable instruments act – value added act (VAT) Scope of study of the above topics to cover definition / scope / penalties / salient feature / recent amendments affecting hospital management only for the exam evaluation.

REFERENCE
2. Bare acts relating to hospital laws - government of India publications.

Core VI - BEHAVIORAL SCIENCES

UNIT I
Medical ethics - introduction, application of APA ethical code to practice, surrogates for decision making, incompetent patients, patient detainment and treatment against their wishes.

UNIT II
UNIT III
Human development - the beginning of life, the school age, adolescence, adulthood, death and bereavement. Human sexuality - common sexual behaviors, dysfunctions. Psychoanalytical theories and defense mechanisms, substance abuse, withdrawal, tolerance, substance dependence, interventions, withdrawal reactions.

UNIT IV
Sleep and sleep disorders, Axis I and Axis II diagnosis - somatoform disorders - eating disorder, dissociative disorder, impulse control disorder, schizophrenia, mood disorder, anxiety disorder, personality disorder (cluster A, B, C). Organic disorders - signs and symptoms.

UNIT V
Psychotherapeutic drugs - antipsychotics, antidepressants, electroconvulsive therapy, mood stabilizers, anxiolytics. Selection of drugs and side-effects.

REFERENCES

Core VII - INTRODUCTION TO HISTOLOGY

UNIT I
Epithelium - lateral, basal and apical domains, different types. Connective tissue - collagen, elastic fibers. Cartilage - chondrocyte, hyaline, elastic and fibrocartilage, disease conditions.

UNIT II
Muscle - microscopic structure, properties of red and white muscle, mechanism of contraction, disease states. Blood function, endothelial cell functions and diseases, coverings of heart, fibrous skeleton, conducting system, blood vessels of heart.

UNIT III
Gastro-Intestinal tract - tongue, enterocytes, layers, oesophagus, stomach, small and large intestine, appendix, anal canal, associated glands. Skin - types of skin, epidermis, dermis, structure of hair, sweat gland, sebaceous gland, structure of nail.

UNIT IV
Nervous system - CNS, PNS, neurons, glial cells, Schwann cell, myelination of neuron, cerebral cortex, cerebellum, spinal cord, cerebrospinal fluid, disease conditions. Respiratory - parts of respiratory tract, function, cells, changes in normal histology. Urinary - urinary tract and their function, uriniferous tubule, ureter, urinary bladder.
UNIT V
Endocrine - different glands, location, function, histological structure. Male reproductive - parts of system, histological structure, spermatozoa, blood-testis barrier. Female reproductive - ovary, oogenesis, uterus, fallopian tube, vagina. Special sense - eye, retina, functions, ear - external, middle and internal, equilibrium and hearing.

REFERENCES

Core VIII - BIOSTATISTICS

UNIT I
Introduction to basic statistics: Introduction to concepts - Experimental settings and tests of hypothesis – Areas of application in statistics - Introduction to some essential features - Data recorded in routine clinical practice - qualitative and quantitative observations - Scale of measurement.

UNIT II

UNIT III
Probability and probability distribution: Introduction to probability – measurement of probability and Laws of probability for independent events – conditional probability, Bayer’s theorem and application of probability – probability distribution – binomial, poison, Normal “t”.

UNIT IV
Sampling Distribution and Estimation – central limit theorem, sampling techniques, Point and Interval, estimation of population parameters of large samples - tests of significance: large and small sample size, distribution of chi square, parametric and non-parametric tests.

UNIT V
Linear regression and correlation: Introduction – scatter diagram, Correlation and regression – correlation coefficient and Regression equation and restrictions.

REFERENCES
2. Statistical Methods - Elhance
3. Statistical Methods - S.P.Guptha
UNIT I
Matter - classifications, separations and separating mixtures. Significant figures, units, temperature, relative temperatures, density. Dalton's atomic theory, consequences, radioactivity. The α-particle experiment, nuclear atom and structure, scales of atoms isotopes, atomic and mass numbers, the periodic table, the Mole, Avogadro's number, molar mass.

UNIT II

UNIT III
Introduction to reactions in aqueous solutions - electrolytes, types, representation using chemical equations, notation for concentration. Oxidation - reduction - general principles, state changes, oxidation and reduction half-reactions. Gases - Properties of gases, pressure, barometric pressure, manometers, gas laws, ideal gas equation, general gas equation.

UNIT IV

UNIT V
Metals and nonmetals, ions atomic radius, ionization energy, electron affinity, periodic properties of the elements, acid base nature of element oxides. Chemical Bonding I - Basic concepts, Lewis theory, structures for ionic compounds, Covalent bonding, coordinate, multiple and polar covalent bonds, electronegativity, formal charge, alternative Lewis structures

REFERENCES

Skill Based Subject I - CALCULUS

UNIT I
Algebra and functions: Simplifying expressions, indices, expanding brackets, factorizing, manipulating surds, rationalization. Quadratic functions: Plotting quadratic curves, solving quadratic equations, completing the square, quadratic formula, sketching quadratics.

UNIT II
Equations and inequalities: Simultaneous equations, elimination, substitution, quadratic and linear equations, linear inequalities, quadratic inequalities. Co-ordinate geometry in the (x,y) plane: Straight line, equation and gradient, alternative form for the equation of a straight line, harder problems, conditions for parallel and perpendicular lines.
UNIT III
Differentiation: The derivative, formula for the gradient of $x^n$, gradient formula for simple functions, expanding and simplifying functions for differentiation, second order derivatives, rate of change, equation of tangent and normal.

UNIT IV
Integration: Integrating $x^n$, integrating simple expressions, using the integral sign, simplification of expressions before integrating, finding the constant for integration.

UNIT V
Energy: Potential energy, kinetic energy, mechanical energy, thermal energy, simple problems. Universe - special relativity: Introduction, the principle of relativity, unity of space and time, inertial frames, reference frames, Lorentz contraction.

REFERENCES

Core IX - MEDICAL COMMUNICATION

UNIT I
Definition of medical communication and information literacy, introduction to medical information resources - print and electronic. Ethics and communication, patient autonomy, justice, beneficence, and patient's rights.

UNIT II

UNIT III
Information literacy - resources for physicians and patients. Difficult patient encounters - breaking bad news and truth telling, domestic violence, child abuse, child neglect, the hostile patient. The multidisciplinary team, introduction to research, APA style.

UNIT IV
Communication filters - cross cultural patients and working with interpreters, gender and sexuality, cultures. Pediatric patients and parents, working with special need populations.

UNIT V
Shared decision making, communicating risk, talking about mistakes and dealing with complaints. Topics on writing newsletters - introduction to newsletter.

REFERENCES
Core X - ORGANIC CHEMISTRY

UNIT I
Carbon compounds and chemical bonds- structural theory, isomers, three dimensional shapes. Representative carbon compounds, functional groups, intermolecular forces. Introduction to IR spectroscopy

UNIT II
An introduction to organic reactions, acids and bases - reactions and mechanisms, intro to acid base chemistry. Alkanes - nomenclature, conformational analysis and introduction to synthesis - shapes, IUPAC nomenclature.

UNIT III
Steriochemistry, chiral molecules - isomerism, stereo isomers, constitutional isomers, enatiomers, chiral molecules. Nucleophilic substitution and elimination reactions of alkyl halides - nucleophiles, S_N2, S_N1.

UNIT IV
Alkenes and alkynes I - properties and synthesis, elimination reactions of alkyl halides, relative stabilities.Alkenes and alkynes II - addition to alkenes, addition of hydrogen halides to alkenes.

UNIT V
Radical reactions - introduction, hemolytic bond dissociation energies. Alcohols and ethers - nomenclature, synthesis from alkenes, hydroboration - oxidation, conversion into alkyhalides.

REFERENCES
  Publisher: John Wiley & Sons, Inc.

Core XI - DIAGNOSTIC TOOLS

UNIT I

UNIT II
Urine analysis: collection – physical, chemical and microscopic examination of urine – CSF Parasite analysis.

UNIT III
Biochemical analysis of blood, blood banking, transplantation, lab safety, ELISA, RIA, FACS, PCR, computers in lab, quality control.
UNIT IV
Equipment, basic techniques of modern imaging modalities: MRI, CT, PET, X-ray, angiogram (DSA), nuclear medicine, ultrasound - contrast and special radiography procedures - other imaging techniques: Histopathology imaging techniques

UNIT V
Quality Control in Radiology & Radiation Safety: Quality control procedure in radiology as per NABH. Biological effects of radiation, radiation dose, effects of time, distance and shielding, personnel and area monitoring, X-ray rooms, dark, ICRP / AERB recommendations.

REFERENCES
1. Handbook of medical lab technology – Ed; V.H.Talib, CBS publication
5. Medical Microbiology by Jawetz

Core XII - HOSPITAL ALLIED SERVICES

UNIT I
Pre-clinical and para-clinical department - microbiology, pathology, pharmacology, forensic medicine, community Medicine. General medicine and surgery, super-specialties.

UNIT II
Nursing: Definition, concepts, philosophy, objectives, characteristics, nature and scope of nursing practice, functions of nurse, qualities of a nurse, categories of nursing personnel, history of nursing in India, caring and advocacy ethics, code of ethics and professional conduct for nurses.

UNIT III
Physical therapy, occupational therapy, advanced cardiovascular sonography, anesthesia technology, cytotechnology, diagnostic medical sonography, paramedics- emergency medical technician, exercise physiology, exercise science.

UNIT IV
Medical assisting, medical illustration, neurodiagnostic technology, orthotic and prosthetic technology, orthotist/prosthetist, perfusion, personal fitness training, polysomnographic technology, recreational therapy, specialist blood banking technology, transfusion medicine.

UNIT V
Intraoperative neurophysiologic monitoring, kinesiotherapy, lactation consultation, surgical assistance, surgical technology, speech-language pathology and audiology, dental technology, traditional medicines (Indian and others).
REFERENCES
2. Rehabilitation Research: Principles and Applications by Elizabeth Domholdt (ElsevierScience Health Science Div, 2004)
3. Kinesiology :The mechanics and Pathomechanics of Human Movement by CarolOatis (Lippincott Williams & Wilkins; 2008)
7. Clinical Medicine, Kumar and Clark, 8th Edition.
8. Short Practice of Surgery 26th edition, Bailey &Love , Norman S Williams (Author), Christopher JK Bulstrode (Author), P Ronan O'Connell (Author)

Allied Paper IV - GENERAL CHEMISTRY - II

UNIT I
Liquids, solids and intermolecular forces: properties and vaporization of liquids, vapor pressure enthalpy, boiling point, Clausius - Clapeyron equation, sublimation phase diagrams, critical point Van der Waals forces, hydrogen bonding in water, solutions, physical properties, terminologies, concentration gas solubility, vapor pressures, osmotic pressures.

UNIT II
Freezing point, BP, electrolytes, colloidal mixtures, chemical kinetics, rates, measurements, the rate law. Zero order, first order, effect of temperature on reaction rates, Principles of chemical equilibrium, dynamic, equation constant, reaction quotient, Q. Le Châtelier’s principle, acids and Bases, Arhenius theory, Brønsted-Lowry theory of acids and bases.

UNIT III
pH, strong and weak acids and bases, polyprotic acids, ions as acids and bases, molecular structures, Lewis acids and bases. Acid-base equilibria, buffer solutions, Henderson - Hasselbalch equation, acid - base indicators, titration curves, solutions of salts of polyprotic acids. Solubility and complex-ion equilibria, KSP; limitations of KSP, precipitation, solubility and pH

UNIT IV
Entropy and free energy, spontaneity, entropy changes. The second law of thermodynamics, standard fee energy, functions of temperature. Entropy and free energy, functions of temperature, coupled reactions. Electrochemistry, electrode potentials, batteries, corrosion, electrolysis.
UNIT V
Nuclear chemistry, radio activity, natural radioactive isotopes, rate of radioactive decay, nuclear reactions, nuclear chemistry, fission, fusion. Effect of radiation on matter, application of radio isotopes. Organic chemistry, compounds and structures, alkenes, alkynes, functional groups, ethers, aldehydes, ketones, carboxylic acids, amines.

REFERENCES

Skill Based Subject II - INTRODUCTION TO IMMUNOLOGY

UNIT I

UNIT II
Antigen, antibody – Structure, Types, properties and their biological functions. Primary and Secondary lymphoid organs – Thymus, Bone marrow, Lymph nodes and Spleen. Topics in clinical immunology.

UNIT III
Hematopoiesis and development of B and T lymphocytes. Immunoglobulin Gene expression B cell and T cell activation. MHC molecules Response of B cells to antigens. Molecular immunology.

UNIT IV

UNIT V
Transplantation, HLA Typing; Mechanism of Graft rejection. Tumor immunology. Immuno surveillance- mechanisms. Immunodiffusion and Immunoelectrophoresis.

REFERENCES
- Immunology – Kuby., J - 5th Edition
- Immunology – Ivan M. Roitt – Third Edition
- Immunobiology – Janeway and Travers – 5th Edition
Core XIII - INTRODUCTION TO MICROBIOLOGY

UNIT I
Definition and scope of microbiology-- A general account on microbial diversity. Basic principles in microscopy, Types of microscopes- light, dark, phase contrast, fluorescent and electron microscope- (Transmission and Scanning electron).

UNIT II
Bacteriology - structure, physiology and classification, growth, metabolism, genetics and laboratory diagnosis. Clinical bacteriology - gram positive and gram positive cocci, bacilli, enterobacteriaceae, oxidase-positive motile rods.

UNIT III

UNIT IV
Mycology - fungal structure and physiology, classification, anti-fungal agents. Anaerobes, fungal infections, mycoplasma, chlamydiae, mycobacteria.

UNIT V
Parasitology - structure, physiology, protozoa and helminths, anti-parasitic agents. Biosafety, emerging infections, bio-terrorism.

REFERENCES

Core XIV - HOSPITAL INFORMATION SYSTEM

UNIT I

UNIT II
Role of information: right information, process of decision making, literature, database, problems in literature seeking, and standards of information seeking. Securing the information: privacy and confidentiality, law, security and computer crimes.

UNIT III
Changing information system: impact for automation, organizational culture, resistance to change, importance of managing change, and role of healthcare professionals in managing change.
UNIT IV

UNIT V
Overview of HIS: Approaches to HIS- patient based, functional organization based, user department based. Electronic Health Record: functions, implementation, advantages, disadvantages - PACS, RIS, HER, PHR. Telehealth: Types, initiatives, advantages, barriers, future.

REFERENCES
4. Informatics for Health Professionals - Kathleen M.Young
5. Information Technology for the Health Professions - Lilian Burke, Barbara Weill

Core XV - MEDICAL RECORDS

UNIT 1
History and role of medical records in health care delivery, various types of medical records; forms and designs and presentation of the records- uses of medical records- policies-legal aspects of medical records-developments of medical record forms.

UNIT II
Organization of medical records dept: structure, goals. Objectives and functions, duties and responsibilities of medical record officer, medical record technician, assistant medical record technician. Operational policies-working hours and shifts interdependent relations of medical records staff and its importance.

UNIT III
Medical records security-retention and disposal of medical records - documentation practices advantages, filling and retrieval of records and x-rays space and equipment, requirement for medical records department, movable and immovable filing tracks: merits and demerits.

UNIT IV
International classification of disease: history and uses-design of ICD and structure how to use ICD, basic coding guidelines, principles and rules of coding, WHO guidelines, indexing of diseases and operations, salient features of the amendments to the ICD -10, difference between ICD-9 and ICD-10, role of international classification of diseases in managing electronic medical records.

UNIT V
Information required for organizing a medical record: Department methods of commissioning of medical record services and periodical evaluation electronic medical records: advantages,
concerns about medical records computerization, various sections of electronic medical record systems – PACS, RIS, EHR, PHR

REFERENCES

Core XVI - GENERAL PATHOLOGY

UNIT I
Cell injury - causes and mechanism, ischemic, toxic. Reversible cell injury - types, morphology, swelling, vacuolation, hyaline and fatty change. Irreversible cell injury - necrosis

UNIT II
Inflammation and repair - acute inflammation - features, causes and cellular events. Chronic inflammation - causes and types. Inflammatory cells and mediators, wound healing by primary and secondary union, factors promoting and delaying the process

UNIT III
Growth disturbances and neoplasia - Atrophy, Hypertrophy, Hyperplasia, Hypoplasia, Metaplasia, Malformation, Agenesis, Dysplasia. Neoplasia : Classification, Histogenesis, Biologic Behaviour : Benign and Malignant; Carcinoma and Sarcoma

UNIT IV
Tumour and Host Interactions: Systemic effects including paraneoplastic syndromes, Tumor immunology. Autosomal and sex-linked disorders with examples, metabolic disorders

UNIT V
Protein energy malnutrition and vitamin deficiency disorders, radiation injury, disorders of Pigment and Mineral metabolism such as bilirubin, melanin, hemosiderin

REFERENCES
ELECTIVE IA - HOSPITAL FUNCTION AND SERVICES - I

UNIT I
Meaning and scope of patient care services, significance of patient care, role of administration in patient care, classification of Hospital.

UNIT II
Front office services, outpatient services, inpatient services, trauma, accident and emergency services, billing and payment services.

UNIT III
Lab services-pathology, biochemistry, microbiology, collection units, rehabilitation services, blood bank services, telemedicine.

UNIT IV
Operation theatre, intensive care units – neonatal ICU, pediatric ICU, surgical ICU, medicine ICU, neuro ICU and cardiac ICU, sterilization and ward administration.

UNIT V

REFERENCES
1. Management process in Health care - S.Srinivasan
2. Hospital Department Profiles - Gold Berry A.J
ELECTIVE IB – NANO-MATERIALS AND NANO-MEDICINE

Unit I
Structure property relationship of Biological materials: tissues, bones and teeth, collagen, rich tissues, elastic tissues, nanostructured collagen mimics in tissue engineering. Biopolymers: Preparation of nanobiomaterials – Polymeric scaffolds collagen, Elastins, Mucopolysaccharides, proteoglycans, cellulose and derivatives; Dextran, Alginates; Pectins; Chitin.

Unit II
Cardiovascular implants: Role of nanoparticles and nanodevices in blood clotting; Blood rheology; Blood vessels; Geometry of blood circulation; Vascular implants; Cardiac pacemakers; blood substitutes; Biomembranes.

Unit III
Polymeric implant materials: Polyolefin; polyamides (nylon); Acrylic polymers (bone cement) and hydrgels; Fluorocarbon polymers; Natural and synthetic rubbers, silicone rubbers; High strength thermoplastics; deterioration of polymers. Biomaterials for Ophthalmology: Contact lenses; Optical implants for glaucoma; adhesives; artificial tears; Protection gears.

Unit IV

Unit V

REFERENCES
3. Nanofabrication towards biomedical applications Willey – VCHVerlag GmbH&Co, KGaA.

Skill Based Subject III - INTRODUCTION TO BIOCHEMISTRY

UNIT I
Components of Molecular biology, central dogma, DNA organization, introns and exons, DNA replication, enzymes for replication, DNA repair and cell cycle regulation, checkpoints, p53 and Rb proteins, transcription, drugs acting on transcription, translation, Wobble hypothesis, steps in translation.

UNIT II
Gene regulation, Lac operon, epigenetics, Mendelian genetics, autosomal and x-linked inheritance, mitochondrial inheritance, Genetic disorders, genomic imprinting, Chemistry of amino acids, protein folding and misfolding, Zwitter ions, Carbohydrate chemistry, classification, clinical uses, Glycolysis, Embden - Meyerhof pathway.
UNIT III
Citric acid cycle, congenital and acquired lactic acidosis, TCA cycle, Glycogen metabolism, glycogenesis, glycogenolysis, Electron transport chain and oxidative phosphorylation, uncouplers, oligomycin, atractyloside, Lipids, phospholipids, glycolipids, Fatty acid synthesis, glycerol kinase, Fatty acid oxidation, carnitine, Zellweger syndrome.

UNIT IV
Ketone bodies, ketoacidosis, Cholesterol and bile acid metabolism, statins, primary and secondary bile salts, drugs interfering with bile acid, Eicosanoids, prostanoids, leukotrienes, Lipoprotein metabolism, Apo proteins, pathogenesis of atherosclerosis, Urea cycle and its defects, hyperammonemias, aromatic aminoacid metabolism, alkaptonuria, phenylketonuria.

UNIT V
Sulfur containing and basic aminoacid metabolism, tryptophan, niacin, homocysteinuria, branched chain amino acid metabolism, acidurias, nucleotide metabolism, purine and pyrimidine metabolism, anticancer drugs action, Vitamins, deficiencies and clinical manifestations, recombinant DNA technology, PCR, RFLP, Enzymes, Km, Vmax.

REFERENCES
• Harper’s illustrated Biochemistry. 29th edition, McGraw-Hill Medical;
• Swanson TA, Kim SI and Glucksman MJ. BRS Biochemistry, Molecular Biology, and Genetics, 5th Edition. Lippincott Williams & Wilkin. (December 7, 2009)
• Dudek RW. High Yield Cell and Molecular Biology. Lippincott Williams & Wilkin.
• Marks Basic Biochemistry, a clinical approach. 4th edition. Michael Lieberman, PhD; Allan D. Marks, MD.

Core XVII - ENTREPRENEURIAL MICROBIOLOGY

UNIT I
Entrepreneur development, activity, Institutes involved, Government contributions to entrepreneurs, risk assessment. Industrial Microbiology, Definition, scope and historical development.

UNIT II
Microbial cells as fermentation products- Baker’s yeast, food and feed yeasts, Bacterial Insecticides, Legume Inoculants, Mushrooms, Algae. Enzymes as fermentation products- Bacterial and Fungal Amylases, Proteolytic Enzymes, Pectinases, Invertases, and other enzymes.

UNIT III
Mushroom cultivation and Composting- Cultivation of Agaricus campestris, Agaricus bisporus, and Volvariella volvacea; Preparation of compost, filling tray beds, spawning, maintaing optimal temperature, casing, watering, harvesting, storage. Biofertilizers- Historical background, Chemical fertilizers versus biofertilizers, organic farming, Rhizobium sp, Azospirillum sp, Azotobacter sp, as Biofertilizers.
UNIT IV

UNIT V
Brewing- Media components, preparation of medium, Microorganisms involved, maturation, carbonation, packaging, keeping quality, contamination, by products. Production of Industrial alcohol.

References:
1. Industrial Microbiology- L.E.Casida, jr, New age International publication.
2. Entrepreneurial Development in India- By Arora.

Core XVIII - SOCIAL AND PREVENTIVE MEDICINE

UNIT I
Definition and concepts, evolution of public health, important public health acts, health problems of developed and developing countries, health problems in India.

UNIT II
Health planning in India, health goals, organized sector (centre, state, district and block level structures, local bodies, panchayat raj), organization and functions of community health centers and primary health centers, primary health care and concept.

UNIT III
Health manpower, Non – Governmental Organizations (NGOs) and Private Voluntary Organizations (PVOs), unorganized sector, problems of population growth, birthrates, death rates, fertility rates, age-specific mortality rates, MMR, CPR, etc. approaches and methods of contraception, MTP.

UNIT IV
Definition and scope of social sciences in health, concept and significance of social structure and social organization, culture related to health and disease, political and economical aspects of health, concepts and techniques of information, education and communication including counseling methodology.

UNIT V
Objectives and organization of important agencies, like WHO, UNICEF, FAO, ILO, Indian Red Cross Society, UNFPA, World Bank, Asia Development Bank, Ford Foundation, CARE, Rockefeller Foundation, etc. and their role in Health care activities in India

REFERENCES
1. Preventive and Social Medicine – Park. K
Core XIX - INTRODUCTION TO NEUROBIOLOGY

UNIT I
Organizations of nervous system, ascending sensory pathways, descending motor pathways, development of nervous system, brain - function and clinical, spinal cord anatomy, tracts, brainstem organization and structure.

UNIT II
Blood supply and lesions, vertebrobasilar system, ventricles, blood-CSF barrier, Blood brain barrier, meninges, CNS blood supply and classic types of stroke, Cranial nerves I - XII locations and functions.

UNIT III
Electro-physiology - potentials and conduction velocities, synapses, neurotransmitters, kiss and run event, receptors, neuromuscular junction, MEPP, myasthenia gravis, cerebellum - functional anatomy.

UNIT IV

UNIT V
Auditory, Vestibular, olfaction, gustation, proprioception, sensory controls on muscles, pain, neuroinflammation, referred pain, pain modulation pathways. Sleep and sleep disorders, EEG, normal cortical activity, clinical significance of epilepticus.

REFERENCES
- Basic and Clinical Neuroscience, 2nd Edition (2010), Paul A. Young, Paul H. Young, and Daniel L. Tolbert. Published by Lippincott Williams & Wilkins
- Neuroanatomy, An Atlas of Structures, Sections, and Systems. Duane E. Haines, PhD. Published by Lippincott Williams & Wilkins.
- Essential Neuroscience, 2nd Edition. Allan Seigel, PhD; Hreday N Sapru, PhD. Published by Lippincott Williams & Wilkins.

ELECTIVE - IIA- HOSPITAL FUNCTION AND SERVICES - II

UNIT I
Clinical nutrition, dietary management, food service area, stock audit, nutritional counseling, hospital made enteral feed, food regulation, quality control, patient tray service.

UNIT II
Facilities Engineering – Maintenance of Civil Assets- Electrical supply and water supply – Medical gas pipeline – plumbing and sanitation – Air conditioning system – Hot water and steam supply – Communication system – Biomedical engineering department in modern hospital.
UNIT III
Laundry services – Housekeeping services – Energy conservation methods- Cost containment measures in a hospital - mortuary services.

UNIT IV
Patient and pharmacy counseling, ambulance - transportation services – handling and transporting patients, shifting patients – hospital security services – telephone/intercom.

UNIT V
Hospital infection control: Definitions, Hospital infections - importance determinants sources routes of transmission Principles of Control of Hospital infections. Infection control teams, Committees, policies and objectives of infection control department.

REFERENCES
1. Hospital and facilities planning and Design - G.D.Kunders
2. Hand Book of Bio-Medical Engineering - Jacob Kline
4. Maintenance Planning and Control - Antony Kelly
5. Hospital Engineering in Developing Country - Hans Pfeiff, Veera
6. Park K. Text Book on Hygiene and Preventive Medicine, Banarsidas Bhanot.

ELECTIVE - IIB– NUTRITIONAL BIOCHEMISTRY

UNIT I
Introduction to the science of nutrition – function of foods and its relation to nutritional and clinical health, essential nutrients, analysis of food, composition, food habits and food groups.

UNIT II
Carbohydrates- kinds, functions, food sources. Fats- kinds, functions, food sources, essential fatty acids and cholesterol. Proteins- kinds, functions, food sources, complete and incomplete proteins.

UNIT-III
Biological value, Net protein Utilization, Energy Basal metabolism, measurement of BMR, Factors affecting BMR, regulation of body temperature, energy needs, total energy requirements, estimation of energy requirements and value of foods. Balanced diet formulation- Assessment of nutritional status.

UNIT IV

UNIT V
Nutrition at various stages of growth and development; diets for infants, children, adolescents, pregnant women, lactating mothers and older persons. Nutrition challenges of the future – food production and food storages, future foods, new protein foods, new fat foods and changing food habits.
REFERENCES
1. Principles of Nutrition & Dietetics.Dr. M. Swaminathan. The Bangalore printing & publishing Company limited. 88, Mysore Road, Bangalore- 560018.

ELECTIVE - IIIA - HOSPITAL ARCHITECTURE AND MAINTENANCE

UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V
Facilities planning: Transport – Communication – Food services – Mortuary – information system – Minor facilities – others.

REFERENCES
1. Designing for total Quality in Health Care - G.D.Kunders
2. Modern Trends in Planning and Designing of hospitals – Gupta S.K.SunilKant
   Chandra Shekhar.R Satpathy
3. Hospital and Nursing Homes Planning, Organizations & Management-Syed Amin Tabish
4. Hospitals, Facilities Planning and Management - G.D.Kunders
ELECTIVE - IIIB – SPORTS BIOCHEMISTRY

UNIT I
Sports, Exercise and Games: Introduction, calisthenics, Gymnastics, combative and swimming; Yogasana and its importance – Padmasana, Vajrasana, Dhunurasana, and Suryanamaskar; Track and field events – Running and Jumping Team events – Kabaddi.

UNIT II
Skeletal muscle system and metabolic systems in Exercise: Skeletal muscle types; - relation with different types of activities; strength, power and endurance of muscles; - Muscle metabolic systems in exercise; Recovery of muscle metabolic systems after exercise.

UNIT III
Cardio respiratory system: Muscle blood flow and cardiac output during exercise; Oxygen consumption and pulmonary ventilation in exercise; Hypoxia and hypercapnia.

UNIT IV
Physical fitness assessment: Body composition; body fat percentage by skin fold method; BMI; Ideal weight and assessment of muscle mass.

UNIT V
Nutrition for sports and Exercise: Nutritional considerations for sports person: - Carbohydrate: Energy source for sports and exercise; carbohydrates composition for pre-exercise, during and recovery period. Fat: Role as an energy source: effect of fasting and fat ingestion Protein: Protein requirement during exercise, recovery process and protein supplement. Vitamins: Role of B-complex vitamins. Minerals: Role of Potassium and sodium.

REFERENCES
3. Essentials of food and Nutrition by M. Swaminathan Vol I – II.

Skill Based Subject IV - BASIC PHARMACOLOGY

UNIT I

UNIT II
Targets for drug action, receptor proteins, ion channel, control of receptor expression, assay of drug potency: Chemical, bioassay and immunoassay-Drug tolerance and drug dependence.
UNIT III
Pharmacokinetics, Adverse response to drugs, drug intolerance, drug allergy, tachyphylaxis, drug abuse, vaccination against infection, factors modifying drug action and effect.

UNIT IV
Mechanism of action of drugs used in therapy of Respiratory systems – cough, bronchial asthma, pulmonary tuberculosis, cancer chemotherapy, Antimicrobial drugs, bacterial resistance

UNIT V
Thyroid and anti thyroid drugs, insulin and anti diabetic drugs, anti fertility and ovulation inducing drugs.

REFERENCES
- The Pharmacology, Volume I and II – Goodman and Gillman
- Basic Pharmacology – Foxter Cox. Butterworth’s 1980
- Pharmacology and Pharmacotherapeutics – R.S.Satoskar, S.D. Bhandhakam and S.S. Alinapure