Doctoral Program Entrance Test (DPET)

Structure and Syllabus

JSS ACADEMY OF HIGHER EDUCATION & RESEARCH

MYSURU – 570 015

2024

Doctoral Program Entrance Test (DPET) and the Interview

Selection for admission to the Ph.D. program will be through an entrance test followed by an interview.

Entrance Test (MCQ based)	70 Marks
Interview	30 Marks

Doctoral Program Entrance Test (DPET)

The entrance test will be conducted for a total of 70 marks and will comprise two papers:

Paper 1 - Basics of Research Methodology & Biostatistics	35 Marks	**Core Paper:** Compulsory and applicable to all the candidates
Paper 2 - Discipline specific subjects	35 Marks	**Elective:** Candidate to choose one elective paper
Total	**70 Marks**	

1. The entrance will be conducted for 70 marks (70 MCQs for 90 mins duration) and the duration of the test is 90 Minutes.
2. Each question necessitates the selection of a single best response, and all the questions are compulsory.
3. Single best response for a question will be awarded 1 mark.
4. No negative marking will be applied for any incorrect answers.

Only those candidates having a score in the entrance test of 50% or more in the case of the general category and 45% or more in the case of the SC/ST/OBC/Differently Abled, Economically Weaker Sections (EWS) and other categories of candidates will be considered as qualified. The validity of the DPET entrance test scores will be for a period of three years for registration to the JSSAHER Ph.D. program.

Doctoral Programme (Ph.D.) Interview

1. Candidates who qualify in the entrance test shall attend the interview before the Ph.D. Interview Panel (PIP).
2. The PIP shall consider the competence, suitability, research interest, and approach of the candidate who is undertaking the research programme.
3. The assessment will be made for 30 marks and the candidate shall obtain a minimum of 50% (i.e., 15 out of 30) to be considered for the Ph.D. programme.
4. The PIP will select the candidates based on their performance in the DPET and interview.
5. The selected candidates will be provisionally registered for the PhD program.

Syllabus for Doctoral Program-PhD Entrance Test (DPET)

INDEX

Paper I – Basic Research Methodology and Biostatistics

Code: DPRMB

(Compulsory and applicable to all the candidates)

Topics
General research aptitude: Basic general knowledge; Basic scientific concepts; Logical reasoning; Problem solving Computer application and software in research
Characteristic of research: Definition and objectives of research; Research methodology and Methods; Types of research (quantitative, qualitative, descriptive, analytical, applied, fundamental/basic, conceptual, empirical); Research design/ process; Dissemination of research; Literature review.
Ethics and good practices in clinical and experimental research: Plagiarism; Research involving animals and Human subjects; Types of clinical trials and epidemiological research; Conflict of interest; Intellectual property rights.
Mathematical aptitude: Frequency & variances; Mean, median, mode; Standard deviation & Standard of error; coefficient of variances; Graphical representation; Numerical reasoning.
Basic biostatistics: Inferential statistics; parametric tests; non-parametric tests; Hypothesis testing.

Suggested References:

1. Research Methodology: A practical and Scientific Approach, edited by Vinayak Bairagi, Mousami V Munat; Publisher CRC, Talyor & Francis group,
2. Class X- Science & Mathematics textbooks
3. Fundamentals of Statistics; Author - S C Guptha, First edition
4. Biostatistics: The Bare Essentials; Third Editions; Author: Geoffrey R. Norman, David L. Streiner
5. 5.Introduction to Biostatistics Author: Chap T. LE

Paper 2 – Discipline Specific Paper (Elective)

1. Medical Discipline (Code – DPMED)

Topics
ANATOMY: General Anatomy Gross anatomy, histology and applied aspects of, upper limb, lower limb, thorax and back, abdomen and pelvis, Head and neck, basics of histology, osteology and embryology
PHYSIOLOGY: Body fluid compartments, electrolyte balance, acid base balance, transport across cell membrane, blood, Cardiovascular system, Respiratory System, Gastrointestinal system, Renal system, Nervous system, Sensory system, Endocrine system, Reproductive system
BIOCHEMISTRY: Biological importance of carbohydrates, proteins and amino acids, lipids, nucleic acids. Metabolism of carbohydrates, lipids & proteins. Inborn errors of protein, carbohydrate, lipid and nucleic acid metabolism. Macro and microelements and their role in health and disease, Vitamins- biological importance, deficiency manifestations and recommended daily allowances. Molecular biology techniques
FORENSIC MEDICINE AND TOXICOLOGY: Criminal procedure code, Inquest, Medical Certificate, Dying declaration, Examination of dead body at the scene of crime, Different types of autopsies, legal requirements to conduct postmortem examination, Medico-legal interpretation of postmortem due to various causes, classification and description of injuries, firearm injuries, definition and types of sexual offences, Various types of mental disorders, Code of medical ethics, unethical practices, Malpractice, Consent, Definition of Toxicology, Forensic Toxicology, Classification of poisons, diagnosis of poisoning in living and dead, General principles of management of poisoning, Antidotes and its types, Medicolegal autopsy in cases of poisoning, preservation and dispatch of viscera for chemical analysis
MICROBIOLOGY: Classification and characteristics of various bacteria, Bacterial Staining, and Cultivation, Common tests for Bacterial identification, parasitology, Classification and characteristics of various viruses, Laboratory Diagnosis of Viral Infection, Classification of fungi and Common Laboratory Methods for Diagnosis of Fungal Infections, Classification of parasites and Common Laboratory Methods for Diagnosis of parasitic Infections Host-Parasite relationship, Immunity to infection, Immunodiagnosis, Sterilization, and disinfection.
PATHOLOGY: Cell Injury, inflammation and Repair, Circulatory Disturbances, Growth Disturbances and Neoplasia, Immunopathology, Rheumatic fever and Rheumatic Heart Disease, Atherosclerosis and Ischemic Heart Disease, Hypertensive Heart Disease, Cardiomyopathy, Concept of obstructive and restrictive lung disorders, Pneumonias, Pulmonary Tuberculosis, Emphysema, Tumors of lung, Occupational lung disorders, Glomerulonephritis. Nephrotic Syndrome, Pyelonephritis, Interstitial Nephritis, Renal tumors, kidney changes in Hypertension, cystitis, carcinoma Urolithiasis and Obstructive Uropathy, Oral Pathology, Salivary gland tumors, Peptic ulcer, tumors of GI tract, inflammatory bowel disease, Pancreatitis, Anaemia, Hemostatic abnormalities, Coagulopathies, Acute and chronic Leukemia ,Multiple myeloma, Jaundice, Hepatitis, Cirrhosis, Portal Hypertension, tumors of liver, diseases of the gall bladder Diseases of cervix, Diseases of uterus, Trophoblastic disease, Diseases of the breast, Carcinoma of prostate, malignancies of reproductive tract, Pelvic inflammatory disease. Osteomyelitis, Rickets/Osteomalacia, Osteoporosis, Hyperparathyroidisism, Tumors, Arthritis. Nonneoplastic lesions of thyroid, Tumors of thyroid, Adrenal diseases, Parathyroid hyperplasia and tumors and Hyperparathyroidism, Pituitary tumors, Multiple endocrine neoplasia

Topics
PHARMACOLOGY: Pharmacokinetics and pharmacodynamics, Adverse reactions to drugs, Factors modifying drug response, Sympathomimetics, sympatholytics, Cholinergics, Anticholinergics, Ganglion stimulants and blockers, Skeletal muscle relaxants, Local anaesthetics, Drug therapy of various CNS, General anaethetics, Autacoids**,** Drug therapy of hypertension, shock, angina, cardiac arrhythmias, Coagulants and anticoagulants, antiplatelet drugs, Hypo-lipidemics, Emetics and antiemetics, Drugs for constipation and diarrhoea , Drug treatment of peptic ulcer, Drug therapy of bronchial asthma, Pharmacotherapy of cough, Reproductive hormones, Drug therapy of Diabetes, Thyroid hormones, Corticosteroids, Oxytocin and drugs acting on uterus, General principles of antimicrobial chemotherapy, rational use of antibiotics, Penicillins, cephalosporins, fluoroquinolones, macrolides, aminoglycoside, tetracyclines, chloramphenicol and polypeptide antibiotics etc. Chemotherapy of tuberculosis, leprosy, UTI, parasitic infection, fungal infections, Cancer Chemotherapy
COMMUNITY MEDICINE: Role of the family/community in health and disease, socio-economic status, acculturation, Principles, concepts, approaches, methods, barriers of health education, Environment and health, basics of Biostatistics, dimensions, determinants of health, epidemiological triad, natural history of disease, levels of prevention, modes of intervention, morbidity and, mortality indicators, disability indicators, concept of prevention, iceberg phenomena, **I**nfectious disease epidemiology, epidemiological study designs, screening for diseases, screening, association and causation, public health nutrition, epidemiology, management, prevention and control of communicable and non-communicable diseases, Maternal and Child Health, Demography and family planning, Demographic cycle, factors influencing fertility, fertility statistics, different methods of family planning with their mechanism of action, advantages and disadvantages, Occupational health, International health, voluntary health agencies, geriatric health problems, biomedical waste management, disaster management, health planning and management
GENERAL MEDICINE: Acid-base disorders, Fluid and electrolyte disturbances, General principles of pain, Assessment and treatment of pain, infections, pyrexia, macro and micronutrient deficiencies, anemia, osteoarthritis, Etiology, diagnosis and treatment of bacterial, viral, fungal, parasitic infections at various systems in the body, Etiology, clinical features, diagnosis, treatment, prevention of diseases related to cardiovascular, respiratory, gastrointestinal, hematopoietic, liver and biliary tract, renal, genitourinary tract, CNS, immune system, endocrine system, skin and appendages, Common mental health illnesses and their prevention and treatment, substance use, dependence, addiction, screening for mental illnesses
DERMATOLOGY, VENEROLOGY, AND LEPROSY: Infective dermatoses, Infestations, Melanin synthesis, Allergic disorders, Drug eruptions, urticaria, erythema multi-forme, Vesiculo-bullous diseases, Epidermopoisis, Psoriasis, Pathogenesis, Syphilis, Gonococcal and Non-gonococcal infections, HIV infection, Dermatological Emergencies
PEDIATRICS: Growth and development, Nutrition, Immunization, Infectious diseases, Hematological diseases, diseases of Respiratory system, Gastro-Intestinal Tract, Central Nervous System, Cardiovascular system, Genito-Urinary System, Neonatology, Pediatric Emergencies, Fluid-Electrolyte, Genetics, Behavioral Problems, Pediatric Surgical Problems

Topics
OPHTHALMOLOGY: Disorders of the Lid, Disorders of the Lacrimal Apparatus, Conjunctivitis &Ophthalmia Neonatorum, Trachoma & chronic conjunctivitis, Keratitis and corneal ulcers, Corneal ulcer, Scleritis & Episcleritis, diseases of retina, diseases of lens, refractive errors, Community ophthalmology
ENT: Deviated nasal septum, nasal polypi, angiofibroma, tumours, atrophic rhinitis. Tonsillitis, leukoplakia, carcinoma, pharyngitis, peritonsillar abscess, candidiasis, malignancies in this region, Diseases of external ear, middle ear, tumors of ear, vocal cord nodule, vocal polyp, carcinoma, vocal cord palsy, Lymphadenitis, metastatic neck benign and malignant tumors of neck
GENERAL SURGERY: Ulcers and wounds, skin infections, skin tumors, Swellings in the head and neck region, diseases of arteries and veins, diseases of breast, oesophagus, stomach and duodenum, intestinal obstruction, diseases of colon, acute appendicitis, diseases of anus, peritoneal abscess, peritonitis, Hepatic trauma, Hepatocellular carcinoma, gall stone disease, carcinoma of the gallbladder, Acute panacreatitis, pancreatic cancer, Acute abdomen, Hernias of the abdominal wall, Diagnostic studies and techniques in the urinary tract, trauma to the urinary tract, urinary calculi, urinary tract infection, prostatic hyperplasia, tumours of the kidney, epididymo-orchitis, hydrocele, tumours of the testicle, carcinoma of the penis.
OBSTETRICS: Physiology of normal pregnancy, diagnosis of pregnancy, routine antenatal care, management of common symptoms in pregnancy, investigations to be carried out in pregnancy; Drugs prescription during pregnancy and lactation, Hypertensive disorders in pregnancy, Anaemia in Pregnancy, Antepartum haemorrhage, Intrauterine Growth Restriction (IUGR), Multiple pregnancy, Puerperium, and its complications, Ectopic pregnancy
GYNECOLOGY: Disorders of growth, amenorrhoeas, Fibroid uterus, Prolapse uterus, Vaginal discharge, sexually transmitted diseases, Precancerous lesions of female genital tract (cervix, vagina, vulva). Carcinoma Cervix, Carcinoma Endometrium, Carcinoma ovary, Gestational Trophoblastic disease, Menopause and related problems, Endometriosis, disorders of puberty Contraception (Male & Female), Medical terminal of pregnancy
ORTHOPEDICS: Management of Trauma, Sports Medicine, Physical Medicine and Rehabilitation, Orthopedic Neurology, Disorders of Spine, Radiology, Fracture, Orthopaedic Oncology
ANESTHESIA: Oropharyngeal/Nasopharyngeal Airway insertion, Bag Mask Ventilation, Attaching pulse oximeter, BP cuff and ECG electrodes and setting up a monitor

Suggested References:

1. B D Chaurasia's Human Anatomy, 9th edition [All Volumes]; 2022
2. Inderbir Singh’s Textbook of Human Histology, 9th edition, 2019
3. Inderbir Singh’s human embryology 11th Edition, 2018
4. Guyton (Arthur C), Text of Medical Physiology. Recent edn., Prism Publishers, Bangalore.
5. Ganong (William F), Review of Medical Physiology, Recent edn., Appleton and Lange.
6. Murray (ROBERT. KK), Harper's Biochemistry Ed. 26, Prentice Hall. 2003
7. Vasudevan (DM) and SREE KUMARI (S), Textbook of Biochemistry for Medical students, Ed 3, Jay Pee Brothers, New Delhi, 2003
8. ROBBINS (Stanley L) Et. AL, Pathologic Basis of Diseases. Ed 6. Prism Books Pvt. Ltd., Bangalore.

9. MOHAN (Harsh), Textbook of Pathology, Edn 4, Jaypee Brothers, New Delhi.
10. Ananthanarayan : (Ananthanarayan and Jayaram Paniker's) Textbook of Microbiology, Et. & Orient Longman Ltd., Chennai.
11. Paniker (C.K. Jayaram), Textbook of Medical Parasitology, Jaypee, New Delhi
12. Narayanareddy K.S., The Essentials of Forensic Medicine & Toxicology, 20th Edition, 2001, Published by K. Suguna Devi, Hyderabad
13. R.S. Satoskar, S.D. Bhandarkar, S.S. Ainapure, Pharmacology and pharmacotherapeutics, 18th Edition, Single Volume, M/S. Popular Prakashan, 350, Madan Mohan Marg, Tardeo, Bombay - 400 034.
14. K.D. Tripath, Essentials of Medical Pharmacology, V Edition, M/s. Jaypee Brothers, Post Box, 7193, G-16, EMCA House, 23/23, Bansari Road, Daryaganj New Delhi.
15. K. Park, Park's Textbook of Preventive & Social Medicine, 2002, 17th Edition, M/s Banarasidas Bhanot publishers, Jabalpur
16. AK Khurana Comprehensive Ophthalmology, 8th Edition 2022, Jaypee Brothers Medical Publishers, New Delhi
17. Dhingra's Diseases of Ear, Nose and Throat & Head and Neck Surgery, 8th Edition 2022, Elsevier
18. Davidson's Principles and Practice of Medicine, International Edition, 24. Elsevier, 2019
19. Kasper, Fauci, Hauser, Longo, Jameson, Loscalzo, Harrison's Principal of Internal Medicine 19th edition, 3 volumes, McGraw Hill 2015
20. Bailey & Love's Short Practice of Surgery, 2 volumes, 28th edition, Norman S Williams Publishers, 2023
21. Hiralal Konar, DC Dutta's Textbook of Gynecology. 8th Edition 2023, Jaypee Brothers Medical Publishers, New Delhi
22. DC Dutta, Hiralal Konar, DC Dutta's Textbook of Obstetrics. 10th Edition 2023, Jaypee Brothers Medical Publishers, New Delhi
23. Vinod K Paul, Arvind Bagga, Ghai Essential Pediatrics, 10th Edition 2023, CBS Publishers & Distributors
24. Maheshwari & Mhaskar, Essential Orthopaedics by Maheshwari & Mhaskar. 7th Edition 2022, Jaypee Brothers Medical Publishers, New Delhi

2. Dental Discipline (Code – DPDEN)

Topics
Dental anatomy, Oral Histology and Oral Pathology Nomenclature, development and eruption of teeth, eruption and shedding, anatomy of pulp chambers. Embryology of head, face and oral cavity in particular with applied aspects Pathophysiology, clinical features, radiographic characteristics, histological features and treatment of the preneoplastic and neoplastic lesions affecting the oral and maxillofacial regions. Developmental disorders and infectious diseases, injuries and cysts affecting the head and neck region, Systemic diseases and impact on oral health
Dental materials, Oral and Maxillofacial Prosthodontics. Composition, Chemistry, Properties and use of auxiliary dental materials, Direct restorative materials (Bonding, Composites, Cements Direct filling gold and amalgam), Preventive materials - fluorides, pit and fissure, Recent advances in restorative dentistry, Types of removable partial dentures, components of cast partial dentures, diagnosis, treatment planning and rehabilitation of partial edentulous state including the laboratory procedures.
Public Health Dentistry Epidemiology of oral diseases, dental health care delivery, Finance and practice management, biostatistics and research methodology pertaining to dental public health, Indices for oral diseases, Biomedical waste and its management and related regulations, Concepts in cariology and etiology, Management and prevention of dental caries
Oral and maxillofacial surgery, Periodontology Local anesthesia, conscious sedation and general anesthesia techniques and complications, Management of cleft lip, alveolus and palate, clinical features and management of cysts of jaws, benign tumors, Periodontal disease and various diagnostic aids for diagnosis of periodontal disease, Periodontal therapy and implant therapy
Conservative Dentistry and Endodontics, Pediatric and Preventive Dentistry, Orthodontics and Dentofacial orthopedics. Pulpal and periapical diseases, diagnosis, management for root canal procedure. Materials, instruments and equipments used for endodontic procedures, Endodontic emergencies, traumatic injuries and management of discolored teeth. Impact of Growth & development of craniofacial structures, dental arches/occlusion, Preventive and interceptive orthodontics, trauma management and surgical pediatric dentistry, Malocclusion and space management, Recent advances in Endodontics and Pediatric Dentistry.

Suggested References:

1. All Prescribed Textbooks for BDS Undergraduate Program by DCI.
2. Recent advances from Articles
3. Guidelines from the respective subjects Eg: AAPD guidelines.

3. Pharmacy Discipline (Code – DPPHR)

Topics
Pharmaceutical Chemistry: Introduction to pharmaceutical chemistry: definition, scope, and importance, Basics of organic chemistry: structure and reactivity of organic molecules, functional groups, isomerism, and stereochemistry, Medicinal chemistry: design and development of drugs, drug targets, drug-receptor interactions, drug metabolism, and pharmacokinetics, Biochemistry: biomolecules, enzymes, metabolic pathways, and their role in drug action and metabolism
Pharmaceutical Analysis: Basic principles of analytical chemistry: qualitative and quantitative analysis, gravimetric and volumetric analysis, and acid-base titrations, Instrumental methods of analysis: spectrophotometry, chromatography, electrochemistry, and mass spectrometry, Quality control and assurance: validation of analytical methods, reference standards, and stability testing
Pharmacology: Introduction to pharmacology: definition, scope, and importance, Mechanism of drug action: drug-receptor interactions, signal transduction pathways, and molecular targets, Classification of drugs: based on their pharmacological activity, chemical structure, and therapeutic uses. Pharmacokinetics: absorption, distribution, metabolism, and excretion of drugs
Pharmaceutics: Pharmaceutical dosage forms: types, formulations, and factors affecting drug absorption and bioavailability, Drug delivery systems: routes of administration, sustained-release systems, and targeted drug delivery, pharmaceutical technology: physical and chemical properties of drugs, stability, and formulation development, Biopharmaceutics: Biopharmaceutical classification, dissolution tests, Bioavailability.
Regulatory Affairs: Roles & responsibility of CDSCO, ICH guidelines, Clinical trials: phases of clinical trials, informed consent, and ethics in clinical research, Drug approval processes: NDA, ANDA, and post-marketing surveillance
Pharmacognosy: Introduction to pharmacognosy: sources, classification, quality control, and adulteration of crude drugs and their detection. Extraction techniques: successive and exhaustive extraction and other methods of extraction. Separation of phytoconstituents by the latest CCCET and SCFE techniques, including preparative HPLC and flash column chromatography. Phytochemistry: chemical constituents of medicinal plants, their isolation, and biological activities.
Pharmacy Practice: Definition and scope of clinical pharmacy, Concepts in Pharmaceutical Care, Activities of a clinical pharmacist (Drug therapy review, ward round participation, Detection & management of adverse drug reactions, Medication history interview, pharmacist interventions, patient medication counselling), critical evaluation of biomedical literature, Definition, aims & scope of pharmacovigilance, Hospital and its organization**,** Drug distribution systems, Rational drug use, Drug utilization evaluation, Pharmacoeconomic evaluation, Basic clinical pharmacokinetics, Clinical research study designs.

Suggested references:

1. Wilson CO, Gisvold O. Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry. Lippincott Williams & Wilkins; 2004.
2. Stevens E. Medicinal chemistry: the modern drug discovery process. Pearson Higher Ed; 2013 Apr 8.
3. Watson DG. A Textbook for Pharmacy Students and Pharmaceutical Chemists. Churchill Livingstone; 1999.
4. Bertram G Katzung KA. Basic & clinical pharmacology. EGC.
5. Hacker M, Messer WS, Bachmann KA. Pharmacology: principles and practice. Academic Press; 2009 Jun 19.
6. Welling PG. Pharmacokinetics: processes, mathematics, and applications. Amer Chemical Society; 1997.
7. Remington JP. Remington: the science and practice of pharmacy. Lippincott Williams & Wilkins; 2006.
8. Allen L, Ansel HC. Ansel's pharmaceutical dosage forms and drug delivery systems. Lippincott Williams & Wilkins; 2013 Dec 23.
9. Gibaldi M. Biopharmaceutics and clinical pharmacokinetics. Lea & Febiger; 1977.
10. Evans WC. Trease and Evans' Pharmacognosy. Elsevier Health Sciences; 2009 May 27.
11. Bruneton J. Pharmacognosy, phytochemistry, medicinal plants. Lavoisier publishing; 1995.
12. Amato S, Ezzell B, editors. Regulatory Affairs for biomaterials and medical devices. Elsevier; 2014 Oct 27.
13. Textbook of Clinical Pharmacy Practice; Essential concepts and skills. Dr. G. Parthasarathi, Karin Nyfort-Hansen, Milap Nahata, 2nd Edition, Orient Longman Pvt. Ltd.
14. Drug Information- A Guide for Pharmacists, Patrick M Malone, Karen L Kier, John E Stanovich, 3rd edition, McGraw Hill Publications 2006
15. Handbook of clinical research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone. Edition: 2nd ed. Publisher: Churchill Livingstone, Edinburgh, 1994.
16. Principles of Clinical Research edited by Giovanna di Ignazio, DiGiovanna and Haynes.
17. Pharmacoeconomics and outcomes: Applications for patient care, case studies. Authors: Graer DW, Lee J, Odom TD, et al. American college of clinicalpharmacy-2003.
18. Introduction to Applied Pharmacoeconomics, F. Randy Vogenberg, New York; London: McGraw-Hill.
19. Biopharmaceutics and Applied Pharmacokinetics - Leon Shargel, Prentice Hall publication
20. Hospital pharmacy by William. E. Hassan. Edition, 3, illustrated, reprint ; Publisher, Lea & Febiger, 1974 ; Original from, the University of Michigan

4. Biomedical Sciences Discipline (Code – DPBMS)

Topics
Fundamentals of Biochemistry: Introduction to Biochemistry, Cell - Structural organization of cells: Definition and classification, subcellular organelles, Transport mechanisms across membrane. - Chemistry of carbohydrates: Nomenclature, & Definition, classification and their biological importance - Proteins: Definition, Classification, general properties, structural organisation - lipids: Definition, properties, structures, classification, - Nucleic acids: Purines and pyrimidines – structure, structural analogues and their clinical applications, Nucleoside, nucleotide and other biologically important nucleotides, structure, type and function of RNA and DNA. - Vitamins: Definition, classification, chemistry, sources, absorption and transport, biochemical role, RDA, and deficiency, antivitamins and hypervitaminosis of fat and water soluble vitamins - Enzymes: Classification, Coenzyme, Metalloenzymes, cofactors, Active site and enzyme kinetics, Factors Influencing enzyme activity, Enzyme inhibition, Enzymes used for diagnosis. - Metabolism of carbohydrates: Glucose transporters, Glycolysis, Oxidation of pyruvate, TCA cycle, Gluconeogenesis, Cori's cycle, Metabolism of glycogen. HMP shunt pathway, Metabolism of fructose, galactose, uronic acid pathway. - Metabolism of proteins: Dynamic state of body proteins, protein turnover, nitrogen balance, Cellular reactions of amino acids, Formation, transport and disposal of ammonia (urea cycle), Metabolism of amino acids, Specialized products obtained from amino acid metabolism and their importance (Polyamines, creatine, nitric oxide - Metabolism of lipids: oxidation of fatty acids – alpha, beta, omega – beta oxidation of odd chain and even chain fatty acids along with disorders, Formation and utilization of ketone bodies and ketosis, De novo synthesis of fatty acids, elongation and desaturation d. Phospholipids (lecithin and cephalin only) and triglycerides – formation and breakdown, Synthesis of cholesterol (only crucial intermediates), Fate of cholesterol and other compounds derived from cholesterol g. Lipoproteins – classification, metabolism, functions and disorders - Metabolism of nucleic acids: Biosynthesis and breakdown of purine and pyrimidine nucleotides, Salvage pathways and - Clinical biochemistry: Composition of blood, saliva and urine. - Inborn errors of metabolism (Disorders associated with carbohydrate, protein and lipids and their enzyme effects, Tests for Metabolic Disorders in New-born, Important Inborn Errors of Metabolism, Prenatal Screening, Newborn Screening)
Basics of Anatomy - Organization of human body at different levels such as cellular level, tissue level, organ level and system level - Anatomical position, different anatomical planes and anatomical terms - Classification of tissues, types and characteristics of different types of tissues such as epithelial tissue, connective tissue, muscle tissue and nervous tissue

Topics
- Classify glands with examples, Skin, superficial fasica, deep fascia and its modifications - Skeletal system- different types of bone cells, classification of bones with examples, different types of cartilage, classification of joints with examples, characteristic features of a synovial joint - Muscular system – Definition and classification with examples, basic properties of muscles, differentiate skeletal, cardiac and smooth muscles - Cardiovascular system- Structure of heart, chambers of the heart, different types of blood vessels, various types of anastomosis, types of blood circulation - Lymphatic system- functions and components, lymphoid organs and its structure - Nervous system: Structure & organization, classification of neurons with examples, classification of neuroglial cells, types of nerve fibres - Endocrine system- enumerate endocrine glands and its harmonal secretions - Digestive system- functions, parts of gastrointestinal tract - Respiratory system- functions and its components, conducting and respiratory portions, structure of lungs in brief - Urogenital system- functions, structure of kidneys, ureter, urinary bladder and urethra in brief, structure of male and female reproductive organs in brief
Introduction to Physiology & Pharmacology - Introduction to physiology & pharmacology: Organization of the cell, Cell membrane & its function, cell organelles, Intercellular communications, Transport across cell membrane, Membrane potentials – RMP & Action potential, Body fluid compartments, Homeostasis, concepts of physiological norms, range and variations - Composition and functions of blood, Plasma Proteins Red Blood cells – Erythropoiesis, Morphology of RBC, Functions, Normal values, Variations, PCV and ESR Haemoglobin - Structure, Functions, Types, Derivatives. Life span and destruction of RBC & Haemoglobin, Jaundice, Types. Leucocytes – Leucopoiesis Morphology of different types of leucocytes, functions, Variations, Immunity, Platelets – thromopoiesis, morphology, functions, normal values & Variation. Hemostasis and blood coagulation – definition, clotting factors. Mechanism of clotting, Bleeding disorders, Tests for clotting & anticoagulants, 8. Blood groups –ABO system and Rh factor. Blood transfusion - Functions of digestive system: functions and regulation of secretion of saliva, regulation of secretion of gastric juice, regulation of secretion of Pancreatic juice. Function of liver, Composition and functions of bile. Function of gall bladder, Small intestine – Composition and functions of succus entericus, Large intestine – Functions and motility - Respiratory system and its functions: Functional anatomy of respiratory tract, Oxygen transport – O2 –Hb dissociation curve and CO2 transport, Regulation of respiration – Neural & Chemical - Cardiovascular system functions: Functional anatomy of heart, Properties of cardiac muscle, Innervation of the heart - Endocrine system: Introduction to endocrinology, classification, General properties and mechanism of action of hormones. - Chemotherapy, NSAIDS, GIT drugs

Topics
Pathology: - Principles of Pathology: Cell injury and Cellular adaptations, Normal cell, Cell injury- types, etiology, morphology, Cellular adaptations- atrophy, hypertrophy, hyperplasia, metaplasia. Cell death-autolysis, necrosis, apoptosis Inflammation: Introduction, acute inflammation-vascular events, cellular events, chemical mediators; chronic inflammation- general features, granulomatous inflammation - Healing and repair- Definition, different phases of healing, factors influencing wound healing, fracture healing. Haemodynamic disorders- Oedema, hypermia, congestion, haemorrhage, embolism, thrombosis, infarction, Shock Neoplasia- definition, nomenclature, differences between benign and malignant neoplasms including gross, microscopy, biologic behaviour and spread, metastasis. - Environmental and nutritional pathology- smoking, radiation injury, malnutrition, obesity, vitamin deficiencies Immunopathology: Principles of immunity, hypersensitivity reactions, HLA system, autoimmunity, pathology of HIV/AIDS - Infections: Tuberculosis, Malaria, cysticercosis, leprosy, Genetic diseases: common storage disorders. - Haematology: Introduction and Haematopoiesis,Erythrocyte disorders, Morphology of RBC, Normal values, Variations, PCV and ESR, Anaemia-introduction and classification (morphological and etiological), Nutritional anaemias -Iron deficiency anemia, distribution of body iron, iron absorption, causes of iron deficiency, lab findings, megaloblastic anemia: causes, lab findings. - Haemolytic anemia: definition. Causes, classification, and lab findings. - WBC disorders- Quantitative disorders, - leukemia:introduction, and classification, acute leukemia, chronic leukemias, - Bleeding disorders- introduction, physiology of haemostasis, Classification causes of inherited and acquired bleeding disorders, thrombocytopenia, DIC, laboratory findings,Pancytopenia,Plasma cell disorders,Lymph node and spleen Lymphadenopathy, TB lymphadenitis, Hodgkin's disease, non-Hodgkin's lymphoma, splenomegaly - Clinical Pathology and Cytology**:** Introduction to clinical pathology- collection, transport, preservation, and processing of various clinical specimens, Basic diagnostic cytology: FNAC, Exfoliative cytology**,** Urine analysis, Body fluids, semen analysis. - Transfusion Medicine: Criteria to select blood donor, Blood group systems, Blood grouping methods, Rh typing, cross matching, Storage, Transfusion transmitted diseases, Transfusion reactions, Blood components- types, indications.
Basics of Microbiology - Introduction to microbiology and clinical microbiology: microscopes, staining techniques, culture media, culture methods. Antimicrobial susceptibility testing. Microbial genetics. Sterilization techniques. Infection, types of infection, nosocomial infection. - Immunological mechanisms in health. - Immune system in humans, innate immunity, acquired immunity. - Antigens, antibodies, complement system, antigen antibody reactions. - Immune response, hypersensitivity, autoimmunity. - Immunodeficiency.

Topics
- Bacteriology: Morphology of bacteria, bacterial cell structure – cell wall, and cell organelles, physiology of bacteria. Some medically important bacteria and identification using biochemical tests, automation, and molecular methods. - Virology: Structure of virus, viral replication, cultivation of viruses, some medically important viruses, their pathogenesis and diagnosis. - Parasitology concepts and diagnostic methods**:** classification of parasites causing human infection, life cycle and pathogenesis and diagnosis of some medically important parasites. Stool examination, concentration methods, peripheral smear. - Mycology: classification of fungi. Cultivation of fungi. Some medically important fungi, their pathogenesis and laboratory diagnosis. - Applied microbiology (Hospital acquired infections, biomedical waste management): Prevention of infectious diseases. Latest guidelines of biomedical waste management. Laboratory diagnosis of infectious diseases.

Suggested R**eferences:**

1. Murray, Robert.K.M, Harpers Illustrated Biochemistry. Published by Lange Medicals.
2. D.M.Vasudevan and Sreekumari S. Textbook of Biochemistry for Medical students. Published by Jaypee Medical Publishers, New Delhi.
3. Champe, Harvey & Ferrier. Lippincott's illustrated reviews of Biochemistry Published by Lippincott, Williams and Wilkins.
4. U. Satyanarayana Textbook of Biochemistry. Published by Books and Allied (P) ltd.
5. Debajyoti Das Biochemistry. Published by Academic publishers.
6. A.K. Jain Textbook of Medical Physiology,6th edition 2015 Avichal publication.
7. Indu Khurana Medical Physiology for Undergraduate students, 1st edition 2012, Elsevier.
8. Venkatesh D, Sudhakar H H Textbook of Medical Physiology, 2nd Edition, Wolter's luwer.
9. Guyton & Hall Text of Medical Physiology 13th Edition, 2015, Elsevier.
10. Ganong's Review of Medical physiology, 25th edition, 2016, Tata McGraw Hill.
11. Sastry Apurba S - Essentials of Medical Microbiology, 3rd Edition, Jaypee brothers Medical Publishers Pvt. Limited, 2021.
12. Robbins and Cotran Pathologic Basis of Disease, 10th Edition - May 11, 2020.
13. Tejinder Singh Aster Textbook of Haematology Arya Publications.
14. Kenneth Kaushansky, Marshall A. Lichtman, Josef T, Prchal , Marcel M. Levi , Linda J. Burns, David C. Linch ,Williams, Hematology 10th Edition.
15. Harsh Mohan, Textbook Of Pathology Jaypee Brothers Medical Publishers (P) Ltd.

5. Life Sciences Discipline – Biological Sciences (Code – DPLBS)

Subjects: Biotechnology and Bioinformatics, Biochemistry, Molecular Biology, Nanoscience & Technology, Microbiology and Cosmetic Science

Topics
Introduction to life sciences: Biodiversity, Five kingdom classification, Classification of plants and animals. Morphology, anatomy and functions of plant parts and animal systems. Cell theory and cell as basic unit of life, structure of prokaryotic and eukaryotic cells, plant and animal cell and its organelles. Structure and function of biomolecules. Cell cycle and cell division. DNA as genetic material, Structure of DNA and RNA. Photosynthesis and respiration in plants. Human and animal physiology. Principles of Inheritance and Variation. Molecular Basis of Inheritance. Evolution. Human health and diseases. Microbes in Human Welfare. Biotechnology and its applications.
Basics of Chemistry: Structure of atom, Classification of elements and periodicity in properties. Chemical bonding and molecular structure. Classification, structure, metabolism and general properties of carbohydrates, lipids, proteins, enzymes and nucleic acids. Central dogma of molecular biology, Prokaryotic and Eukaryotic DNA replication mechanism, Transcription in prokaryotes, eukaryotes and post transcriptional modification. Prokaryotic and Eukaryotic translation, post translational modification. Biochemical techniques- centrifugation, spectrometry, spectroscopy, chromatography,
Biotechnology applications Recombinant DNA Technology; Genetic engineering techniques; Nucleic acid libraries; Principles and techniques in plant tissue culture and animal cell culture; DNA sequencing methods; Analysis of gene expression (RNA); Genome sequencing - principles and methods; Microarray, Electrophoresis; Blotting techniques; PCR and its types.
Structure and components of ecosystem, ecological adaptations; Natural resources, environmental pollution and health risks, green energy and technology, climate change and current scenario; environmental planning and sustainable development. History and development of Microbiology; Microbial taxonomy and diversity; staining techniques and microscopy; physiology, multiplication, applications of microbes in agriculture, environment, and food.
Bioinformatics in the field of biological research; Biological databases; use of database – NCBI, EMBL, DDBJ, protein structural data bank; Macromolecule sequence analysis (nucleic acids, proteins); Structure prediction; Molecular Modelling; Data Mining Methods; Primer designing; Sequence search tools – FASTA, BLAST; Systems biology; Computational biology. Nanoscale objects and broad applications of nanotechnology, properties of nano materials, classification of nanoparticles, carbon nanotubes, synthesis routes of nanoparticle. Skin pigmentation and skin tanning, melanogenesis, Role of vitamin D and other antioxidants in skin cares, factors affecting skin absorption.

Suggested References:

1. Hardin, J., Bertoni, G., Kleinsmith, L. J., & Becker, W. M. (2012). Becker's World of the Cell. Boston (8th Ed.). Benjamin Cummings.
2. Elliott, W.H., Elliott, D.C. Biochemistry and Molecular Biology 3rd Indian edition, Pub. Oxford
3. Michael T. Madigan, John M. Martinko, Kelly S. Bender. (2012). Brock Biology of microorganisms, 14th edition.
4. Prakash S. Bisen, Anjana Sharma. (2013). Introduction to Instrumentation in Life Sciences, 1st edition, CRC press, Taylor & Francis Group.
5. Conner, J. K., and D. L. Hartl, 2000 A Primer of Ecological Genetics. Sinauer Associates, Sunderland, Massachusetts. 304 pp.
6. Lewin B (2000) Genes VII. Oxford University Press, New York.
7. Principles of Gene Manipulation and Genomics. 7th Edition, Sandy B. Primrose, Richard Twyman – Blackwell Publishing
8. Keith Wilson and John Walker. (2010). Principles and Techniques of Biochemistry and Molecular Biology, 7th edition, Cambridge University Press.
9. Subbarao NS. (1994). Soil Microorganisms and Plant Growth. Oxford & IBH Pvt. Ltd. New Delhi.
10. Nanotechnology: Basic Science & Emerging Technologies, Mick Wilson, Kamali, Kannangara & Geoff Smith, Overseas Press India Private Limited, 2005.

6. Life Sciences Discipline - Earth Sciences (Code – DPLES)

Subjects: Environmental Science and Geo-information science

Topics
Introduction: Interdisciplinary nature of environmental science, environmental factors: structure and composition of atmosphere, lithosphere, biosphere, and hydrosphere; Biogeochemical cycles of major environmental elements and significance: carbon, nitrogen, phosphate, sulphate, hydrogen, oxygen, mode of energy transmission.
Ecology: Definition, subdivision, ecosystem- Terrestrial, Aquatic, Grass, flow of energy, food chain, food web, tropic level, ecological pyramid, eco-tone, edge effect. Biomes and Habitat: Classification of biomes – tundra, taiga, grassland, desert, evergreen and deciduous forests, Tropical rain forests and their characteristics, flora, and fauna; aquatic ecosystem.
Environmental Pollution: Noise Pollution: Types, sources, noise exposure levels and standards, consequences, prevention, and control of noise pollution. Air Pollution: Concept of air pollution, sources, types of air pollutants, air quality standards, air pollution indices, effects of air pollution on organisms, materials, and environment. Water and Soil Pollution: Types (ground water, surface water and marine water), sources (point and non-point source), types of water pollutants and consequences
GIS and GNSS: Geospatial technology, advantages and applications. definition of GIS, components of GIS, Application of GIS. Spatial and attribute data, Basic spatial entities, Spatial data models – Raster and Vector: Comparison, Advantages, and limitations. GNSS: Definition, GNSS vs GPS, Segments of GPS system, GLONASS, Galileo, Regional Navigation Satellite Systems (RNSS), GAGAN, IRNSS systems.
Remote Sensing: Definition of Remote Sensing, elements and process of remote sensing, spectral reflectance, curve. Types of remote sensing, remote sensing platforms, satellite orbits; its types, FOV and IFOV. Remote sensing Image Resolutions: spectral, spatial, temporal and radiometric resolutions. Remote sensing satellites: LANDSAT, Sentinel, Cartosat. Application of Remote Sensing.

Suggested References:

1. Understanding Environmental Pollution (3rd Edition) (2010): Marquita K. Hill, Cambridge University
2. Air Pollution: Health and Environmental Impacts (2010): Bhola R. Gurjar, Luisa T. Molina, C.S. P. Ojha, CRC Press.
3. Air Pollution (26th Reprint) (2007): M N Rao & H V N Rao, Tata Mc Graw Hill Publication.
4. Environment Pollution & Management (2003): A. Kumar, C Bohra. L.K. Singh, APH Publishing Corporation.
5. Environmental Pollution Monitoring and Control (2004): S. M. Khopkar, New Age International Publisher.
6. Environmental Modelling with GIS and Remote Sensing (2002): Andrew K Skidmore, Taylor & Francis.
7. GIS and Remote Sensing Techniques (2019): Manishika Jain, Himansu Publications.
8. GIS A visual Approach (2nd Edition) (2021): Brus E Davis, Onword Press.

7. Life Sciences Discipline – Cognitive Science (Code – DPLCS)

Subjects: Cognitive Neuroscience and Psychology

Topics
Cognitive Psychology and Cognitive Science: Introduction to cognitive Psychology and Cognitive Science; Cognition and Brain: Basic Principles; Behavioral, Electrophysiological, and Neuroimaging methods; Attention and consciousness; Memory: Visual Memory, STM and Working memory, and long-term Memory; Language, Brain and Cognition; Speech Recognition; Language Development; Reading development; Reading process; Reasoning and Decision making; Gene-Brain-Behavior Link.
Learning Theories: Functionalistic Theories (Thrndike, Skiiner, and Hull); Associationistic Theories (Pavlov, Guthrie, and Estes); Cognitive Theories (Gestalt, Piaget, Tolman, and Bandura); Biological Theories (Hebb, and Bolles).
Personality Theories: Personality Psychodynamic perspective (Freud, Jung, Adler, Horney, Erikson); Humanistic and Existential perspective (Erich Fromm, Carl Rogers, Maslow); Cognitive perspective (George Kelly, Rotter, Bandura); and Eastern perspective (Indian).
Psychological Testing Clinical Assessment and Clinical Assessment: Functions, origins, and application of psychological testing; Item development and item validation; Development of norms and the meaning of test scores; Reliability and Validity of tests; Types of tests. Principles and methods of clinical assessment; Assessment of cognitive functions; Assessment of personality.
Child and Adult Psychopathology: Attention Deficit Disorder; Appositional Defiant and Conduct Disorder-causes and management; Childhood Anxiety and Depression Disorders; Enuresis, Encopresis, Sleep walking-Causes and Management; Learning Disability; Autism-causes and management; Mental Retardation-Types, Classifications-causes, prevention and Management.

Suggested References:

1. Cognitive Psychology: Applying the science of mind 2nd Edition- Bridget Robinson-Riegler & Greg L. Robinson-Riegler. Pearson Education, New Delhi, 2008
2. Cognitive Psychology: A Student's Handbook, 6th Edition - Michael W. Eysenck, and Mark T. Keane. Taylor and Francis Inc., New York, 2005.
3. Cognitive Psychology: Connecting mind, research, and everyday experience (2nd edition). - Goldstein, E. B. Thomson/Wadsworth., 2008.
4. Research design and methods – A process approach. 5th Edition. Kenneth S. Bordes & Bruce - New York: Tata-McGraw Hill, 2002.
5. Psychological Testing – Anne Anastasi and Susana Urbania, New Delhi: Pearson Education. 7th edition.
6. Introduction To Theories of Learning. Hergenhahn - New Delhi: Pearson Education 2008 10. Personality and personal growth. Robert Frager & James Fadiman. New Delhi: Pearson Education. 2007. 6th edition.
7. Abnormal Psychology and Modern life. C. R. Carson & N. J. Butcher 2007. Harper & Collins.
8. Abnormal Psychology. R. G. Meyer (1990).
9. Allyn & Bacon. Inc. 18. Model for Clinical Psychopathology. C. Eisdorfer et al. MTP Press Ltd.

8. Life Sciences Discipline - Medical Physics (Code – DPLMP)

Subject: Medical Physics

Topics
History of Radioactivity: Law of successive disintegration – Natural radioactive series-Radioactive equilibrium- Secular and transient equilibrium - General properties of alpha, beta and gamma ray X-rays: Discovery - Production - Properties of X-rays - Characteristics and continuous spectra - Design of hot cathode X-ray tube - Basic requirements of medical diagnostic, therapeutic and industrial radiographic tubes - Rotating anode tubes - Hooded anode tubes - Industrial X-ray tubes
Principles of medical imaging include X-ray, computed tomography (CT): Conventional X-ray tomography (Basic principle), Data Accumulation, Original EMI Scanner, Scanning motions or Generations- First, Second, Third and fourth Generations, Principle of Helical CT Scan and Scan Parameters (kV, mAS and pitch)-Other scan configurations-X-ray tubes, Collimators, Detectors-Scintillation crystal and Xenon Gas Ionization chamber, Image reconstruction, Magnetic Resonance image: magnetic resonance imaging (MRI) – Hydrogen characteristics, magnetization vector, Precession, flip angle. proton density, relaxation time T1 & T2 images – Comparison of T1 and T2- image characteristics – MRI system component), and positron emission tomography (PET).
The effects of ionizing radiation on living systems, including cellular and molecular mechanisms of radiation damage, and the response of tissues and organs to radiation exposure. Principles of medical dosimetry, including dose calculations, treatment planning, and quality assurance.
Fundamentals of radiation therapy, including the physics of radiation, and treatment planning. Principles of nuclear medicine, including radiopharmaceuticals, imaging techniques, and therapy.
Principles of medical health physics: Safety in the Medical uses of Radiation, Radioactive Waste Disposals and Transport of Radioisotopes, Legislation Radiation Emergencies and Their Medical Management including radiation protection, safety regulations, and quality assurance

Suggested References:

1. S. B. Patel, Nuclear Physics - An Introduction – New Age Internationa
2. W. J. Meredith & J. B. Massey, Fundamental Physics of Radiology.
3. E. J. Hall, Radiobiology for Radiologists, J. B. Lippincott Co., Philadelphia, 2000
4. F. H. Attix. Introduction to Radiological Physics and Radiation Dosimetry, Viley-VCH, Verlog, 2004.
5. Christensen's-Physics of Diagnostic Radiology by Thomas S Curry, III.
6. H. E. Johns and Cunningham. The Physics of Radiology.4th edition Charles C. Thomas
7. W. H. Blahd, Nuclear Medicine, McGraw Hill Co., New Delhi, 2002.
8. Introduction To Theories of Learning. Hergenhahn - New Delhi: Pearson Education 2008 10. Personality and personal growth. Robert Frager & James Fadiman. New Delhi: Pearson Education. 2007. 6th edition.
9. Abnormal Psychology and Modern life. C. R. Carson & N. J. Butcher 2007. Harper & Collins.
10. Abnormal Psychology. R. G. Meyer (1990).
11. Allyn & Bacon. Inc. 18. Model for Clinical Psychopathology. C. Eisdorfer et al. MTP Press Ltd.

9. Life Sciences Discipline - Medical Statistics (Code – DPLMS)

Subject: Medical Statistics

Topics
Basic statistics Introduction and importance of Biostatistics, Frequency distribution, Diagrammatical and Graphical Representation, Measures of central tendency and dispersion, Skew ness and Kurtosis. Scale of Measurements. Simple correlation coefficient, Multiple and Partial Correlation. Linear and Multiple Regression.
Probability and Distribution Theory Probability –Basic concepts and definitions, Laws of Probability, Bayes theorem, Probability Distribution: Binomial, Poisson, Geometric, Normal, Exponential, Beta and Gamma distributions- Properties Sampling distributions; Student-t distribution, F-distribution and Chi-square distribution- Properties and applications.
Sampling theory and statistical Inference Data collection and categorization; primary and secondary data, development of Questionnaire. Census and Sample Surveys, Probability and Non Probability Sampling, Sampling and Non sampling errors. Size of samples, Merits and limitations of sampling. Testing of hypothesis, Student's t test, F test, Chi square test, Non Parametric Inference: Introduction, Advantages of non-parametric methods over parametric methods. One Sample Problem: Sign Test, Wilcoxon-Signed rank test, Kolmogorov- Smirnov Test, Mann-Whitney U test, Median test, Kruskal –Wallis test. One way and two way ANOVA.
Multivariate Analysis Multivariate normal distribution, its properties and characterization. Random sampling from a multivariate normal distribution. Maximum likelihood estimators of parameters. Distribution of sample mean vector. Inference concerning the mean vector when the covariance matrix is known. Matrix normal distribution. Multivariate central limit theorem. Wishart matrix -its distribution and properties. Distribution of sample generalized variance. Hotelling's T2 statistic -its distribution and properties. Classification and discrimination procedures for discrimination between two multivariate normal populations - sample discriminant function, tests associated with discriminant functions, classification into more than two multivariate normal populations. Principal components, canonical variables and canonical correlations. Elements of factor analysis and cluster analysis. Multivariate linear regression model - estimation of parameters and their properties. Multivariate analysis of variance [MANOVA] of one-way classified data. Wilk's lambda criterion.
Operation Research **Demography:** Measures of mortality, description of life table, construction of complete and abridged life tables, maximum likelihood, MVU and CAN estimators of life table parameters. Vital Statistics-Measures of fertility, models for population growth, intrinsic growth rate, stable population analysis, population projection by component method and using Leslie matrix.

Topics
Quality control and Sampling Inspection: Basic concepts of process monitoring and control, General theory and review of control charts, O.C and ARL of control charts, CUSUM charts. Acceptance sampling plans and TQM. **Reliability**: Reliability concepts and measures, components and systems, reliability function, hazard rate, common life distributions viz. exponential, gamma, Weibull, lognormal, Rayleigh, piece-wise exponential etc. Reliability of multicomponent systems.

Suggested References:

1. Kingman, J F C & Taylor: Introduction to Measure and Probability. S.J. (1966). : Cambridge University Press.
2. Montgomery, D.C, Peck and Vining, G.G. (2002): Introduction to Linear Regression Analysis (John Wiley & Sons.)
3. Kapur, J.N. Sexena, H.C.: Mathematical Statistics & S. Chand & Co.
4. Goon, A.M., Gupta, M.K: Fundamental of Statistics, Vol. II ed. VI and Dasgupta, B. word Press Calcutta 1988.
5. Cochran W.G.: Sampling Techniques (3rd Edition, 1977), Wiley.
6. Des Raj and Chandak (1988) : Sampling Theory, Narosa.
7. Anderson T.W. (1983) : An Introduction of Multivariate Statistical analysis, second Edition John Wiley.
8. Bhuyan, K.C : Multivariate Analysis and its applications.
9. Spiegelman H: Introduction to demography, Harvard University Press.
10. Montgomery D.C, (1985): Statistical Process Control, Wiley.

10. Life Sciences Discipline - Nutrition & Dietetics (Code – DPLND)

Subjects: Nutrition & Dietetics

Topic
Introduction to food, nutrition and dietetics: Definitions- Health, nutrition, nutrients, food, diet, balanced diet, Malnutrition, under nutrition over nutrition optimum nutrition. Concept of foods and classification of food – Macro & Micronutrients Introduction to Nutrition- Terms used in Nutrition and Health. Energy- Unit of energy, food as a source of energy, definition of calorie and joules, energy requirement and factors affecting it.
Food Adulteration and food laws: Food Adulteration and Food Laws- Definition, Types, Common adulterants and home scale methods of detecting adulterants. Food Laws– FSSAI, PFA, BIS, AGMARK, FPO, HACCP, FAO/WHO Codex Alimentarius commission.
Nutritional problems in community: Incidence of nutritional problems, signs, symptoms, and treatment. Communicable and non-communicable disease- causes, modes of transmission and preventive measures. **Nutrition Intervention programs & National Nutrition policy:** Nutrition Intervention programs in India: Genesis objectives and operation of National Anemia Control Prophylaxis Program, National Goiter Control Program, Vitamin A Prophylaxis Program, School Lunch Program. CMNMP, ICDS, TINP. **Nutrition Education & Methods of Assessment of nutritional status:** Nutrition Education: Its importance to the community. Qualities of training workers in nutrition education programs, integration of nutrition with education and extension work. Methods of education, when to teach, whom to teach. Direct and indirect methods of nutritional assessment.
Nutraceuticals and functional foods **Primary and secondary metabolites in plants** – a) Vitamins b) Carotenoids c) Conjugated linolenic acid d) Flavonoids e) Amino acid Omega – g) 3 PUFA f) Terpenoids. **Mechanism of action** – Anticancer, influence on blood lipid profile, antioxidant, anti-inflammatory and osteo genetic properties Proteins, modified proteins, Starch, cellulose, hemicelluloses, hydrocolloids and gums- functional properties Organic components present in food, Vegetables, Cereals, milk and dairy products as Functional foods. Spices and herbs as potential sources of nutraceuticals **Nutrigenomics, personalized nutrition, nutrigenetics-definition and application** Definitions - Nutrigenomics, Metabolomics, Proteomics, Pharmacogenomics and Transcriptomics Inter-relation between, nutrient-gene interactions, nutrigenomics and non-communicable diseases Impact of nutrigenomics – nutrition research, nutrition therapy, food industry and nutrition policy

Topic
Gene-Diet Interactions Influence of Macro, Micronutrients and Nutraceuticals on gene expression. Different approaches of Nutrient – Gene interactions, Possible models for such interaction. Nutrigenetics and Nutrigenomics: Importance of Functional foods and Personalized nutrition.
Role of nutrients in sports performance: Macro and micronutrient: carbohydrates, fats, proteins, minerals, and vitamins functions and role of nutrients. Hydration and ergogenic aids- assessment on dietary, physical fitness, biochemical and clinical status, nutritional counseling techniques in sports, somatotyping, kinathropometry

Suggested References:

1. Understanding Normal and Clinical Nutrition, Eighth Edition, Sharon Rady Rolfes, Kathryn Pinna, Ellie Whitney. Wadsworth, Cengage Learning2009.
2. Nutrigenomics and Nutrigenetics in Functional Foods and Personalized Nutrition Lynnette R. Ferguson, 2013, CRC Press.
3. Life Cycle Nutrition – An evidence-based approach, Sari Edelstein, Second Edition.2014.
4. Modern Nutrition in Health and Disease, Robert J. Cousins PhD (Author), Katherine L. Tucker Ph.D. (Author), Thomas R. Ziegler M.D., 11th Edition, 2014.
5. Joshi, S.A. (1992): Nutrition and Dietetics, Tata McGraw Hi 11 Publications, New Delhi.
6. Nutraceuticals and Functional Foods in Human Health and Disease Prevention, Debasish Bagchi, Harry G. Preuss, Anand Swaroop, 2015., CRC press.
7. Lanham SA, Stear SJ, Shirreffs SM, Collins AL, (2011), Sports and Exercise Nutrition, A John Wiley & Sons, Ltd., Publication.
8. Winter EM, Jone AM, Davison RCR, Bromley PD and Mercer TH, (2006), Sports and Exercise Physiology Testing -guidelines, The British Association of Sport and Exercise Sciences Guide Volume II: Exercise and Clinical Testing.
9. Belski R, Forsyth A, Mantzioris E, (2019), Nutrition for sports, exercise and performance. A Practical guide for students, sports, enthusiasts and professionals. 1st Edition. A&U Academic.
10. Kussmann M, Stover PJ, editors. Nutrigenomics and proteomics in health and disease: towards a systems-level understanding of gene-diet interactions. John Wiley & Sons; 2017 May 8.

11. Management Discipline – Management Studies (Code – DPMNG)

Subjects: Management and Marketing

Topics
Management Theory & Concepts: Management function & tools, Fundamentals of Planning & Decision–making, Organizing & Staffing, Leading, Controlling **Strategic Management:** Basic Concepts in Strategic Management, Competitive Analysis, Strategy Formulation, Strategy Implementation, Strategy Evaluation and Control
Marketing Management: **Introduction:** meaning and definition, functions of marketing, value and scope, and importance of marketing. **Core marketing concepts:** Needs, wants, and demands. Marketing strategy and the marketing mix: market segmentation, market targeting, market differentiation and positioning, and marketing mix. **Marketing management:** Marketing management orientations (production concept, product concept, selling concept, marketing concept, and societal marketing concept), and marketing management process. **Business Environment:** **Business:** Importance, objectives, classification of business activities – industry and commerce. Industry: classification of industry. Commerce – classification. **Types of Business Environment:** Internal to the Enterprise - Value System, Management Structure and Nature, Human Resource, Company Image and Brand Value– Digital Economic Environment. **External environment to the Enterprise:** Microenvironment-Suppliers, Competitors, Lenders, Macro Factors- Demographic, Political, Economic, Legal, Technological, Socio-Cultural, Ecological & Global.
Managerial Economics: Basic Definition of Economics and the concept of Managerial Economics. Ordinal and Cardinal Utility, Market, types of market and Price determination in different market. The concept of national Income, business cycle and the concept of inflation **Financial Management**: Introduction to financial management, tools of financial analysis and planning, investment in capital assets, sources of finance, valuation, working capital management, cost of capital, capital structure and Dividend policy.
Human resource management: Significance and functions of HRM, Human resource planning, Job analysis, job evaluation, recruitment, manpower training performance appraisal, emerging trends in HRM, trade Union, Industrial disputes, settlement mechanism, grievance redressal. **Organizational behaviour**: Organizational Behavior-Definition, Multidisciplinary Nature of OB, Determinants of Personality, Motivational theories: Maslow's Hierarchy of Needs theory, Douglas McGregor Theory X and Theory Y, Team and groups, Leadership styles, Sources of organizational power, Reasons for organizational politics, Conflict management strategies and intra individual conflicts, Strategies to handle organizational stress, Organizational culture and change management.

Topics
Business Statistics: Introduction to Statistics, types of data, collection of data, Frequency Distribution and Graphs, Measures of Central Tendency, Measures of Dispersion and Skewness. **Research Methodology:** Research, types, and methods of Research, Research problem, designing of research and sample and sampling, Data collection and Hypothesis testing. **Operation Research: Introduction -** An overview and significance, features, definitions, scope, phases, methodology, applications and scope of operations research. **Linear Programming Problem** – advantages, disadvantages, formulation of Linear Programming Problem solution using Graphic solution method problems limited to two constrains (maximisation and minimisation).

Suggested References:

1. T. Ramaswamy: Principles of Management, HPH
2. Rekha & Vibha – Management Process, Vision Book House.
3. Koontz & O'Donnell, Management, McGraw Hill.
4. L M Prasad, Principles of Management, Sultan Chand & Sons
5. V.S.P Rao, Management process and organization, Excel Books
6. Business Policy, 2nd Ed. - Azhar Kazmi
7. Strategic Management, 12th Ed. - Concepts and Cases - Arthur A. Thompson Jr. and A.J. Strickland
8. Management Policy and Strategic Management (Concepts, Skills, and Practices) - R.M. Shrivastava
9. Business Policy and Strategic Management - P. Subba Rao
10. Strategic Management – Pearce
11. Marketing Management – Philip Kotler and Kevin Lane Keller (Latest Edition)
12. Essentials of Business Environment - K. Aswathappa
13. Business Environment - Text and cases - Francis Cherunilam
14. Managerial Economics- D N Dwivedi
15. Financial Management: S Chand
16. Financial Management: Prasana Chandra.
17. Financial Management: I M Pandey
18. Financial Management: M Y Khan and P K Jain
19. Textbook on Human Resource Management by VSP Rao.
20. Textbook on Human Resource Management by K Ashwatappa.
21. Organizational Behavior, VSP Rao, Excel Books
22. Organizational Behavior, K. Aswathappa, Himalaya Publishing House Pvt. Ltd.
23. Business Statistics : Dr. B H Suresh and G H Mahadevaswamy
24. Business Research Methodology: S L Gupta and Hitesh Gupta
25. Research Methodology – Methods and Techniques By C R Kothari, Second revised edition.
26. Operations Research – J.K. Sharma
27. Operations Research – Kalavathy.S

12. Yoga Discipline – Yogic Sciences (Code – DPYGS)

Subject: Yoga & Research Methodology

Topics
History & Origin of Yoga: Introduction to Yoga- what is yoga, health & disease according to WHO; Introduction to Yoga education & its importance- what is Physical education, difference between yoga & exercise, importance of yoga education in school; Origin of Yoga- prevedic , vedic period & post vedic period view
General Perspective of Yoga: Definitions of Yoga according to Patanjali, bhagavat gita; Objectives of Yoga; Importance of yoga; Misconceptions about Yoga ; Introduction to different schools of Yoga – what is karma yoga, bhakti yoga, jnana yoga & raja yoga; Yogic Lifestyle- what is lifestyle & lifestyle according to yoga.
Introduction to Yoga text: Introduction to Patanjali Yoga sutra – Names of Pada/chapters of Patanjali Yoga sutra; Brief introduction of sage Patanjali; Introduction to Hatha Yoga texts: Names of shatkriyas; number of asanas & names of pranayama in Hatha Yoga Pradeepika text; number of asana in gheranda samitha text; Introduction to Veda & Upanishad: What is Veda & Upanishad; types of Veda; Numbers of main Upanishad.
Introduction to Yoga Practices: Names of Standing & Sitting Series of Asanas; Names of Supine & Prone Series of Asanas; Name of Pranayama & Relaxation technique.
Introduction to Research methodology : Definition of research; brief introduction to types of research- names of methodology; Brief introduction to research methodology & Statistics- what is statistics, what is sample and what is population; Introduction to physiology- What is heart rate & normal heart rate; What is blood pressure & normal value of blood pressure; what is respiratory rate & normal respiratory rate per minute; what is pulse rate & normal pulse rate per minute; Define exercise & its uses.

Suggested References:

1. Lal Basant Kumar: Contemporary Indian Philosophy, Motilal Banarsidas Publishers Pvt. Ltd, Delhi, 2013.
2. Dasgupta S. N: History of Indian Philosophy, Motilal Banarsidas, Delhi, 2012
3. Singh S. P: History of Yoga, PHISPC, Centre for Studies in Civilization Ist, 2010
4. Singh S. P & Yogi Mukesh: Foundation of Yoga, Standard Publication, New Delhi,2010
5. G.C pande, Histroy of science, philosophy, and culture of Indian Civilization Vol. VII part 10 Centre for Studies in Civilizations.
6. Asana, Pranayama, Bandha, Mudra by Swami Satyananda Saraswati Bihar School of Yoga.
7. *Ganong's* Review of *Medical Physiology*, 25th edition.
8. Research Methodology: Methods and Techniques by C R Kothari.
9. Hospital pharmacy by William. E. Hassan. Edition, 3, illustrated, reprint; Publisher, Lea & Febiger, 1974 ; Original from, the University of Michigan

13. Occupational Therapy Discipline – Occupational Therapy (Code – DPOTY)

Subject: Occupational Therapy

Topics
Treatment approaches and models in occupational therapy: NDT, Motor Learning, Sensory Integration, PNF, Roods Approach, Motor Relearning Program, Task Oriented Approach, Multi-Context Approach, Cognitive Disability FOR, Rehabilitative Approach, Other OT Related Approaches, Biomechanical Approach, Occupational Behaviour Frame Of Reference, Cognitive Behaviour Frame Of Reference, Psycho Dynamic Frame Of Reference, Psycho Analytical Frame of Reference, Occupational Behaviour Model, Model Of Human Occupation, Person-Environment-Occupation Model, Ecology Of Human Behaviour Model, Activities Health Model, Psychosocial Model
Occupational therapy in orthopaedic conditions: Foundational Concepts, Evaluation of The Musculo-Skeletal Systems, General Investigative and Surgical Procedures, Occupational Therapy Treatment Strategies for Upper Extremity, Hand, Lower Extremity, Vertebral Column and Spine, Standardised Assessment and Scales
occupational therapy in neurologic conditions: Foundational Concepts, Evaluation of The Neurological Systems, General Investigative and Surgical Procedures, Occupational Therapy Treatment Strategies for Intracranial Neurological Disorders, Disorders of Spinal Cord and Root, Disorders of Peripheral Nerve and Muscle, Multifocal Neurological Disease, Standardised Assessment and Scales
Occupational therapy in paediatric conditions: Human Development and Maturation, Current Trends in Developmental Theory, Review of Paediatric Diagnoses, Paediatric Health Care Services in India, Evaluation of The Paediatric Systems, General Investigative and Surgical Procedures, Major Theoretical Approaches in Paediatric OT Management, Occupational Therapy Treatment Strategies, Methods of Evaluating Component Functions of Behaviour in Children, Standardised Assessment and Scales
Occupational therapy in psychiatric conditions: Basic Concepts of Human Growth and Psychology, Classification of Mental Disorders, Symptoms of Mental Illnesses, Introduction to Psychiatric OT, Skills in Psychiatric Occupational Therapy, Frames of Reference in Psychiatric Occupational Therapy, Methods of Evaluation in Psychiatric Occupational Therapy for Psychiatric Disorders in Adults, Child Psychiatry, Geriatric Psychiatry, Standardised Assessment and Scales

Suggested References:

1. Kielhofner's Research in Occupational Therapy: Methods of Inquiry for Enhancing Practice, Renée R. Taylor, F. A. Davis, 2nd Edition.
2. Frames of Reference for Paediatric Occupational Therapy, Paula Kramer, Wolters Kluwer, 4th Edition.
3. Bruce & Borg's Psychosocial Frames of Reference Theories, Models, and Approaches for Occupation-Based Practice, Terry Krupa, Bonnie Kirsh Routledge, 4th Edition.
4. Clinical Orthopaedic Rehabilitation: a Team Approach, Charles E. Giangarra, Robert C. Manske, Elsevier, 4th Edition.
5. Cognitive and Perceptual dysfunction: A clinical reasoning approach to evaluation and intervention, Carolyn Unsworth, F. A. Davis, 1st Edition.
6. Motor control: Therapy and Practical Applications, Anne Shumway-Cook, Marjorie H. Woollacott, Williams & Wilkins, 5th Edition.
7. Clinical Reasoning in Physical Disabilities, Rebecca Dutton, Williams & Wilkins, 1st Edition.