SGT UNIVERSITY
SHREE GURU GOBIND SINGH TRICENTENARY UNIVERSITY
(UGC Approved) Gurugram, Delhi-NCR
Budhera, Gurugram-Badli Road, Gurugram (Haryana) – 122505 Ph. : 0124-2278183, 2278184, 2278185

Faculty of Allied Health Sciences

Program Outcomes (POs)

Faculty of Allied Health Sciences

VISION

- The vision of the Faculty of Allied Health sciences is to establish it as state of the Art faculty and to make it the most sought after faculty, at least, in the NCR by imparting quality education, practical exposure and research par excellence with other top universities / departments in the country, thereby bridging the gap / demand of Allied Health care professionals in the region.
- To improve literacy in Haryana with a special focus on female education.

MISSION

Providing allied health students with the knowledge and skills basic to the practice of their disciplines, instilling them with the fundamental attitudes of professionalism, teaching, research and compassionate care for a diverse patient population.

OBJECTIVES

(1) To develop benchmark curricula and syllabus and to achieve the national and international acceptability for our innovative academic content.

(2) To adopt newer teaching methodologies for providing excellent educational programmes for allied health profession students and to impart quality education for the youth to shape them into a skilled professional empowering them towards entrepreneurial accumenship.

(3) To create facilities for quality research oriented labs in all the disciplines and promoting excellence through teaching, research and service.

(4) To inculcate in our students the habit of developing innovative skills in addition to lifelong learning attitude.

(5) To encourage the students to use the information technology tools and carry out research work– field, laboratory and clinical, with the aim of publishing the work and presenting the findings at indexed national and international scientific journals.

Programme Outcomes of B.Sc

Student seeking admission for B.Sc. in Allied Health Courses programme are expected to imbue with following quality which help them in their future life to achieve the expected goals:

PO 1. Acquire the knowledge with facts and figures related to various subjects of its programme.

PO 2. Acquire the skills in handling instruments, planning and performing various tests in their respective department laboratories using quality control and following quality assurance.

PO 3. Acquire the necessary communication skills to deal with the team and patients.

PO 4. He/She will be able to work as tutor in Paramedical Institute and work as a research associate in hospitals/research institutes.

Programme Specific Outcomes of M.Sc

After completion of this programme the candidate will be able to:

PO 1. Acquire the knowledge and skills in handling instruments, planning and performing various tests in their respective department laboratories using quality control and following quality assurance

PO 2. Identify, formulate, research literature, and analyze complex problems.

PO 3. Write and Implement various case studies of patient to publish the research article.

PO 4. Work in Teaching Institutes and teach undergraduate and post graduate students

PO 5. Pursue higher studies like Ph.D

PO 6. Compete in discipline specific competitive exams conducted by various bodies.

PO 7. Acquire enough skills to get him/her placed in various corporate bodies.

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Program Specific Outcomes (PSOs)

Bachelor and Master of Optometry

VISION

The program is envisaged to develop a multipurpose ophthalmic manpower at paramedical level.

MISSION

To train students to become a competent person in providing services as an Optician, Optometrist, Refractionist and Ophthalmic Assistant to the community in urban, semi-urban and rural settings in private, semi-Governmental and Governmental sectors.

OBJECTIVES

(1) Impart modern Knowledge in the field of optometry with most effective teaching aids and methodologies

(2) Promote high quality experiential learning environment that leads the students towards entrepreneurial acumanship

(3) Inculcating the habits of innovative thinking in students leading to evolving of viable techniques/ technologies

Program Specific Outcomes (Bachelors of Optometry)

At the end of program students will be able to:

PSO 1. Detect any defect in vision, diagnose and treat it effectively.

PSO 2. Prescribe and dispense spectacles and contact lenses.

PSO 3. Carry out certain investigations like Tonometry, Syringing, Keratometry, Lensometry, Biometry, Fundus fluorescein angiography, Pachymetry, Pantacam, OCT etc. necessary to diagnose and treat various diseases.

PSO 4. Meet the demands of various MNCs involved in marketing of optical and ophthalmic instruments taking advantage of soft skills and management skills imparted during training

Program Specific Outcomes (Masters of Optometry)

At the end of program students will be able to:

PSO 1. To provide primary eye care services.

PSO 2. To able to provide best corrected visual acuity by the help of spectacle, contact lens, low vision aids and vision therapy.

PSO 3. To able to determine the Diagnosis and their management accordingly.

PSO 4. Practice in clinic for enhancing the better visual service in urban and rural areas as well as Governmental and Non-Governmental Organizations.

PSO 5. To provide the individual contact lens service, Low vision devices and vision therapy as well as limited medication such as lubricants eye drops, Antibiotic, Anti-allergic, NSAIDs etc.

PSO 6. How to communicate to the patient's and counseling about particular diseases.

PSO7. Adopt the skills of Optometry as an entrepreneur ultimately becoming 'Individual primary eye care professional'.

PSO 8. Practice independently and manage optometry clinics.

PSO 9. Contribution to National programme for control of blindness.

PSO 10. Teach optometry and vision sciences.

PSO 11. Work as scientists in Eye banks, and Research and Referral Institutes.

Department of Medical Laboratory Technology

VISION

Our *vision* is to enhance our reputation as a world-class teaching and research institution which is recognized for its innovation, excellence and discovery, and attracts the best students and staff worldwide.

MISSION

The mission is to provide a platform for ideal integration of intellect, values and talents through education and develop each child to his optimum potential to enable him to make path breaking changes in the social fabric of the world.

- The student should be encouraged for maximum participation in research.
- To invite companies dealing in biomedical equipments for conducting training programme.
- To organize interaction programmes by collaboration with communication department.
- By providing them problem based question on practical/case study more practice sessions can be conducted.

OBJECTIVES

(1) The department should inculcate equal focus on research.

(2) The students should be provided exposure on a large scale on the working of different modern equipments used in Hospital labs.
(3) To encourage students in image building/personality development programmes.
(4) To provide more hands on practice sessions for laboratory work.
(5) To encourage them to actively participate in national and international conferences.

Programme Specific Outcomes BMLT (Bachelors of Medical Laboratory Technology)

At the end of the programme students will be able to:

PSO 1. Understand the correlation between the microbes, enzymatic changes, pathological findings in the clinical diseases which will help them to work professionally as a laboratory technical staff in hospital laboratories and research laboratories.

PSO 2. Implement high standards of ethical behavior in dealing with patients and other health care professionals

PSO 3. Use evidence-based practice to find, understand, interpret, and apply research findings to the professional practice

PSO 4. Apply knowledge to create, analyze and interpret data to validate a new method/instrument, quality program and apply the results/information to professional practice.

Programme Specific Outcomes MMLT (Masters of Medical Laboratory Technology)

PSO 1. Implement practical based knowledge and Work as Application Specialist in MNC's like biomeriux, Roche diagnostics, Merck etc.
PSO 2. Maintain laboratory equipment in accordance with laboratory procedures to the extent that laboratory safety and test results without error of clinical significance are assured.
PSO 3. Intergrate sound theoretical and practical knowledge to create a base for future entrepreneurship.
PSO 4. Use evidence-based practice to find, understand, interpret, and apply research findings to the professional practice

Department of Radio Imaging Technology

VISION

To be counted as one of the forerunners in rendering world standard and quality imaging solutions which is a massive part of patient care and diagnosis as well as to provide practically applicable education to students and professionals in order to facilitate innovative thinking, building resources

and using them to the advantage of the field of radio imaging technology.

MISSION

To provide cost-effective, world class and immersive branches of education to students that would, at the same time, benefit the patients in terms of care and prognosis and the students in terms of experience, skillset and research.

To encourage students to make them take the path of maximum research, conviction and ethics by providing them with engaging classes, important conferences and faculty support.

OBJECTIVES

The primary objective of the Radio Imaging Technology graduate program is to train radiographers with the knowledge, skills and competency to provide optimum quality professional services in a wide variety of settings including academic, governmental, corporate, military and community-based organizations.

Programme Specific Outcomes BRIT (Bachelors of Radio Imaging Technology)

After the completion of the course students will be able to:

PSO 1. Pursue Masters and can specialize in any of the imaging modalities.

PSO 2. Professionally work as a Technologist both in public & private sector.

PSO 3. Work as Application Specialists in MNC's like GE, Philips, Siemens.

PSO 4. Work as Health care professional in corporate world.

PSO 5. Work as teaching faculty in Institutes or University.

Programme Specific Outcomes MRIT (Masters of Radio Imaging Technology)

After the completion of the course students will be able to:

PSO 1. Pursue Ph.D.

PSO 2. Work as Application Specialists in MNC's like GE, Philips, Siemens

PSO 3. Work as Lecturer in Institutes or University.

PSO 4. Work as a part of health team in intensive care unit and operational theatre.

PSO 5. Work as Health care professional in corporate world.

Operation Theatre Technology

VISION

To create specialist OT technologists through competency-based training programme who would provide high quality health care and advance the cause of science through research & training and will deal effectively the needs of the community related to his specialty.

MISSION

1. Provide comprehensive clinical experience in the field of OT Technology to provide optimum quality services in a wide variety of settings including emergencies.
2. To create a category of health personnel that is well oriented, clinically competent, aware of safety issues & quality assurance, care and handling of modern electromedical equipments and knows proper documentation / record keeping.

OBJECTIVES

(1) Students will understand the role and scope of the operation theatre technology in the healthcare setting with respect to preoperative and postoperative care of the patient.

(2) Students will develop skills necessary to identify the treatment procedures and requirements based on various surgeries or operating procedures.

(3) Students will be able to educate patients on strategies to prepare the patient coming for the operational procedures.

(4) Students will develop continuous professional and technical growth so as to become a professional and successful team leader.

(5) Students will be able to apply principles of safe practice in operation theatre technology.

(6) Student will be able to demonstrate skills in maintenance of complete operation theatre room.

Program Specific Outcomes BOTT (Bachelors of Operation Theatre Technology)

Upon the completion of the course student will be able to:

PSO 1. Apply the knowledge and skills of handling operation theatre room to provide safe and effective care to individual undergoing operational procedures.

PSO 2. Demonstrate relative knowledge and understanding of vital parameters to be maintained during respective operations.

PSO 3. Skills to access, analyze and evaluate the information gathered during the treatment.

PSO 4. Demonstrate the ability to plan, organize and report different diagnosis related to treatment.

PSO 5. Prepare trolleys for various types of anaesthesia, surgery and emergency procedures.

PSO 6. Care and handling of various types of surgical instruments and equipments used in OT and ICU.

PSO 7. Assesses the patient for any complications with an understanding of the problem and recognizes the need to report the complications to the surgery.

PSO 8. Understand professional and ethical responsibilities in patient care.

PSO 9. Responds effectively to the physical and emotional needs of the patient undergoing surgical treatment.

PSO 10. Understanding of standard operating procedures and protocols for treatment/ research work.

PSO 11. Develop skills of good clinical practice as an individual and as a team member.

PSO 12. Use of recent technologies to provide better healthcare services.

PSO 13. Identify and apply the new development in operation theatre technology through continuing education and research.

Department of Nutrition and Dietetics

VISION

The vision of the department is to excel in the field Nutrition and Dietetics and to be frontrunner in the imparting practical education, quality teaching and research.

MISSION

Our mission is to contributing to the knowledge-base of nutrition undergraduate and post graduate and doctorate students through high quality teaching, training, and research and mentorship. Providing service to professional, governmental, and local community organizations.

OBJECTIVES

The overall goal of the department of is to contribute to the health and wellbeing of the Human across the globe. The primary goal of the department is to train Nutrition experts with the latest knowledge, leadership and skills to become active partner in healthcare development and provide professional Nutrition services in a wide variety of settings including academic, government, corporate and military & community based organizations.

Program Specific Outcomes BND (Bachelors of Nutrition and Dietetics)

At the end of program students will be able to:

PSO 1. Understand the basis of human nutritional requirements and recommendations through the life cycle and translate the knowledge into practical guidelines for dietary needs.

PSO 2. Develop capacities and abilities and enable them to pursue higher education and research in Nutrition and Dietetics.

PSO 3. Be familiar with the recent advances in nutrition and dietetics and applies this knowledge in planning for public health programmers.

PSO 4. To provide latest scientific based knowledge and skills for being active partners in Nutrition domain of health sectors.

PSO 5. Deliver innovative, research-based interventions and service programs which alter meal patterns and food choices with the goal of improved health of individuals, families and communities.

Program Specific Outcomes MND (Masters of Nutrition and Dietetics)

At the end of program students will be able to:

PSO 1. Become health care professionals for services in various fields of clinical nutrition and medical nutrition management and related areas such as hospitals academics, research, industry, clinical nutrition department, training, extension and community service.

PSO 2. Impart knowledge and develop capacities of the undergraduate students in the areas of human nutrition viz. food science, food safety quality control and food product development.

PSO 3. Understand the etiology, physiology and metabolic anomalies of acute and chronic diseases and patient needs.

PSO 4. Demonstrate competence in basic concepts of research methodology used in clinical and public health nutrition; and therapeutic aspect of various diseases.

PSO 5. Practice evidence based therapeutic nutritional care and management backed by scientific knowledge.

PSO 6. Be familiar with the special nutritional support techniques and feeding formulations essential for nutritional care and support.

PSO 7. Exercise empathy and a caring attitude and maintain professional integrity, honesty and high ethical standards. Plan and deliver comprehensive therapeutic nutritional support using the principles of dietetics.

PSO 8. Be familiar with the recent advances in nutrition and dietetics and applies this knowledge in planning for public health programmers.

PSO 9. Be well versed with various aspects of food science, product modification and product

development enriched with multiple nutrients and evaluating its nutritive and sensory qualities.

PSO 10. Be familiar with the use of information technology tools and carry out research work– field, laboratory and clinical, with the aim of publishing the work and presenting the findings at indexed national and international scientific journals.

Program Specific Outcomes PhD (Doctorate of Philosophy)

At the end of program students will be able to:

PSO 1. To become a researcher in the health care sectors for providing research services in various fields of clinical and related areas such as hospitals, industry, training, extension and community set up.

PSO 2. Be familiar with the use of information technology tools and carry out research work– field, laboratory and clinical, with the aim of publishing the work and presenting the findings at indexed national and international scientific journals.

PSO 3. Develop competence in advanced concepts of research methodology used in clinical and public health nutrition; and therapeutic aspect of various diseases.

Neuro Physiology Technology

VISION

To be recognized as an excellent neuro physiology Technologist center in education, clinico Laboratory service, Innovations and research by promoting a climate of teamwork and collaboration with renowned national and International such centers.

MISSION

- To provide well trained professionals for neuro physiology Technology and allied industries to meet the well trained men power requirements.
- To provide quality teaching and skill development to the students of neuro physiology technology and inculcate in them the research aptitude leading to innovation simultaneously providing better patient care.

OBJECTIVES

(4) Promote the acquisition of knowledge and provide experience in laboratory direction and management and encourage students to assume a leadership role in the education of other physicians and allied health professionals

(5) Promote the development of investigative skills to better understand neurophysiologic processes as they apply to both individual patients and the general patient population.

(6) The graduates will get hands on experience in various aspects of neurophysiology technology viz. electrophysiology equipments, medical programme developers, software testing for EEG, EMG/NCV machines.

(7) To gain experience and skill in interpreting emergency portable EMG/NCV, EEG in patient and intensive care setting.

(8) The program will help the graduates to take up responsibilities in testing, Identifying and analyze complex epilepsy and neurological diseases.

(9) Promote effective communication and sharing of expertise with peers and colleagues.

Program Specific Outcomes BNPT (Bachelors of Neuro Physiology Technology)

At the end of program students will be able to:

PSO 1. Explain the processes involved in neural communication that allow for cell-cell signaling, muscle force production, involuntary and voluntary movement, and locomotion.

PSO 2. To become proficient in interpreting adult, pediatric and neonatal electroencephalograms.

PSO 3. Professionally work as a neurophysiology technologists in hospitals/labs.

PSO 4. Setup their own electrophysiology labs.

PSO 5. Work as a fitness coach for athletes who examine their nerve and muscles.

PSO 6. Apply the knowledge gained during the course of the program from human neuro anatomy and neurophysiology, Basics of pharmacology and computing in particular to identify,formulate and solve real life problems faced in laboratories during test, in industries and/or during research work.

PSO 7. Understand relationship with patients and patient care. Able to work with different kinds of machines used in different organization and laboratories with their working.

Microbiology

VISION

The vision of the department is to be recognized for quality teaching and to nurture potential talent and provide a solid platform for their overall development.

MISSION

Our *mission* is to grow as a department where teaching and research would go hand in hand, offering support and facilities to all our students and to provide learning opportunities and working experience for staff and students alike.

OBJECTIVES

- Provide comprehensive theoretical and practical skill and enable the students to pursue further studies in specialised branches of microbiology
- To impart sound knowledge of all application based subjects related to this field and to make them aware of the future prospects of research oriented study.

Programme Specific Outcome (Bachelors of Microbiology)

At the end of program students will be able to:

PSO 1. Determine impact of role of microorganisms in and around our environment.

PSO 2. Apply microbiology and molecular biology techniques in production of food products, medicines, vaccines to name a few.

PSO 3. Practice methods for enhancing the production and productivity of soil and water microflora and fauna in the field of microbial ecology

PSO 4.Integrate wet laboratory and dry laboratory techniques to create entrepreneurship in specific subject of interest

PSO 5. Develop research models to study role of microbes in genetics, physiology, dairy technology, immunology and recombinant DNA technology.

PSO 6. Adopt skills of molecular biology and basic microbiology techniques to further pursue research

PSO 7. Practise good ethical standards while dealing with sensitive areas of research/studies like gene cloning and genetically modifies foods.

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Course Outcomes (COs)

Course Outcome of B.Sc. Nutrition & Dietetics

SEMESTER 1

BASIC NUTRITION

CO1: The course will provide basic concepts of nutrition sciences.

CO2: Introduction to food, food groups, concept of balance diet, energy and RDA & its uses

CO3: Able to describe importance of food and nutrition, for human health and related terminologies and definitions.

CO4: Functions, food sources, deficiency disorders and recommended intakes of all macro and micronutrients related to human nutrition.

CO5: Student will be able to describe minerals and vitamins, their role in human health, sources, requirements, consequences of deficiency and toxicity on human health.

CO6: It educate about the role of water in human body, its requirement and effect on human body

CO7: Student will able to explain the concept of energy for survival of human its intake and expenditure, requirement for human and food sources.

CO8: The process of digestion, absorption, transport and utilization of food in human body.

CO9: They will be able to describe effect of cooking on the nutritive value of foods.

CO10: Aware about processed and low cost supplementary foods.

CO11: Importance of food sanitation and hygiene for human health

CO12: Students will get to know about the recent concepts in food/nutrition science viz. Designer food, genetically modified food, bio fortification

FAMILY MEAL MANAGEMENT

CO1: Understand meal management and nutritional requirements

CO2: Aware and learn about the definitions and terminology used in Nutrition

CO3: Understand the effect of stress over the health

CO4: The role of effective meal planning for healthy diet and its management aspects.

CO5: Impact of foods habits on planning of nutrition chart

CO6: Knowledge about myths and faddism for food

CO7: Awareness about the Indian recipes ingredients

CO8: Create knowledge of daily allowances according to nutrition labeling in various food products.

CO9: Students get aware about nutrients composition tables for well understanding of nutrients.

Concept towards nutrient density in commonly consumed food

NUTRITIONAL BIOCHEMISTRY

CO1: Students will be able to define the term energy and the unit of energy, enumerate the term BMR and explain the factors affecting BMR

CO2: Develop understanding and explain the methods applied to calculate the energy requirement of different categories

CO3: Able to identify and explain the major monosaccharide's, disaccharides, and polysaccharides found in the human body and diet.

CO4: Describe the overall purpose of glycolysis and gluconeogenesis, its reactants and products, its cellular localization, and its tissue distribution

CO5: Students will be able to describe amino acid structure and properties. They will understand and can write the classification of amino acids. Define peptide bond formation in amino acid

CO6: The students will be able to identify and explain the major classification of protein, describe how the body digests proteins.

CO7: Define various aspects of protein metabolism, its transport and cellular metabolism, regulation at substrate, enzyme, hormonal & organ level and associated disorders.

CO8: Explain how the urea cycle prevents toxic concentrations of nitrogen

CO9: Differentiate between the different types and classifications of fatty acid obtained from our diet

CO10: Describe the process digestion and absorption of fatty acid and triglycerides, as well as the medical ramification of lipid malabsorption

CO11: Distinguish between the four major lipoprotein complexes (chylomicrons, VLDL, LDL and HDL)

CO12: Describe approaches to Therapeutic Lifestyle Changes (TLC) that can aid in reducing the risk of CHD

CO13: The students will be able to indicate whether the pH level is acidosis or alkalosis

CO14: They can list major sources of acids in the body and can identify the major chemical buffer systems in the body and will also be able to identify the cause of the pH imbalance as either respiratory or metabolic

CO15: Distinguish between acidosis and alkalosis resulting from respiratory and metabolic factors

CO16: They will understand the nutrient requirements, recommended dietary allowances and biochemical functions of vitamins in humans

CO17: They can acquire a fundamental background of the deficiency disorders related to the deficiency of water soluble and fat soluble vitamins

CO18: They will be able to define immunoglobulins, its classify and WHO classification

CO19: They can learn and explain the important properties of each class of immunoglobulins

CO20: The students will study and enumerate the functions of each class of immunoglobulins

PHYSIOLOGY-I

CO1: They will be able to identify and describe the structures and functions of the different types of blood vessels.

CO2: They can identify the major components of blood.

CO3: They will learn to define hemostasis and describe the basic coagulation process, and how ABO and Rh blood types are determined.

CO4: They will learn to outline the cardiovascular system; to state the general properties of cardiac muscle; to describe the conducting system of the heart; explain the events of the cardiac cycle including atrial and ventricular systole and diastole and relate the heart sounds to specific events in the cycle.

CO5: They can define Digestive System; digestives organs, its function and reaction involved in human digestive system.

CO6: They can name the major regions of the brain and describe the locations and functions of each and also name of the cranial nerves, relate each pair of cranial nerves to its principal functions, and relate the distribution pattern of spinal nerves to the regions they innervate.

CO7: They will be able to identify the principal sensory and motor pathways and explain how it is possible to distinguish among sensations that originate in different areas of the body.

COMMUNICATION SKILLS & PERSONALITY DEVELOPMENT

CO1: The students will understand the basic concept of communication, its need in current scenario & how communication is important for a doctor or a medical person

CO2: The students will get clear concept of different kinds & the uses of communication and methods & strategies or effective communication.

CO3: The students will get basic knowledge of sentence & its kind, parts of speech & their uses for correct writing, change the sentences from one form to another, verbs & their uses for correct tense and change the sentences from direct to indirect phonetics

CO4: They will learn sentence formation by Idioms and Phrases, correction of the sentences.

CO5: They will learn word formation & vocabulary building by Prefix & Suffix.

CO6: They will learn certain exercises for verbal & non-verbal communication & its importance in medical education.

CO7: They will understand the importance of interview & its need in modern professionalism, its kind & how to attend an interview

CO8: Group discussion & its need in modern hospital scenario.

CO9: The students will be able to understand written communication & its importance in current scenario.

CO10: They will understand different forms of written communication: Précis, Letter, CV writing & Resume writing. Report writing & its need in current medical scenario. Need of note making & note taking.

HEALTHY LIFE STYLE & NUTRITION

CO1: They will understand the nutrient requirements, recommended dietary allowances and biochemical functions of vitamins in humans

CO2: They will be able to explain the effects on health of deficiency and excess of each nutrient.

CO3: They will able to learn nutrition principles, food plans, preparation techniques and specialized dietary plans.

CO4: They can discuss nutrients needs throughout the life span body composition changes, even in the absence *of* changes in body weight

CO5: They can impart the knowledge of nutrition for fitness and sports.

SEMESTER 2

CO1: The students will understand the etiology, physiologic and nutritional care during pregnancy

CO2: Students will able to recommend and provide appropriate nutritional care during lactation.

CO3: They will learn about the role of hormones, factors affecting the volume and composition of breast milk, nutritional and food requirements

CO4: The students will able to understand how growth & development occur during infancy, its nutritional requirements, food requirements, breast feeding, importance of breast milk, infant formula, preterm baby and role of introduction of supplementary foods.

CO5: The students will learn about growth & nutrient need during childhood (Toddler/Preschool), their nutrition related problems, factors affecting nutritional status and feeding pattern

CO6: The students will learn nutritional requirement of school children, importance of snacks in their life and importance of school lunch during their age

CO7: They will learn about growth & nutrient needs of adolescents, their food choices, eating habits, factor influencing needs and nutritional problems

CO8: They will learn nutritional requirements of adulthood, their food adequacy, low cost balanced diets

NUTRITIONAL BIOCHEMISTRY

CO1: The students will describe how enzymes function as biological catalysts and its name & classification

CO2: They can describe the 4 characteristics of enzymes

CO3:They can describe the effect of temperature, pH, concentration of enzyme and concentration of substrate on enzyme activities

CO4: They will understand and describe the classification of hormones

CO5: The students will learn the distribution of water and electrolytes in the body and their exchanges

CO6: They will understand and explain the term diabetes mellitus, its type, clinical symptoms and their methods of determination.

CO7: They will able to learn and understand various functions and classification of liver

CO8: They will be able to understand and explain the physiological aspects of kidney.

PHYSIOLOGY-II

CO1: They will be able to describe the location and structure of the pituitary gland, and explain its structural and functional relationships with the hypothalamus.

CO2: They can describe the location, structure and function of glands.

CO3: They can describe the structure and function of nephron, processes of urine formation.

CO4: They can describe briefly the processes of urine formation.

CO5: They can describe normal structure and functions of the kidneys

CO6: They can explain pathogenesis and clinical manifestations of glomerulonephritis, nephrosis, nephrosclerosis, and glomerulosclerosis

CO7: They can describe clinical manifestations and complications of urinary tract infections

CO8: They can describe causes of renal tubular injury, manifestations, treatment

CO9: They can describe the normal structure and physiology of RS

CO10: They can identify sites of measuring body temperature.

CO11: They can explain in simple terms the various regulating factors of body temperature.

FOOD SERVICE MANAGEMENT

CO1: The students will be able to define various types of food service institutions and concept of catering management.

CO2: The student will get familiar with the different types of catering equipments, their use /care and determinants for selection for a catering establishment.

CO3: The students will be able to explain the principles/process of selection, purchasing and storage of raw foods for catering establishment.

CO4: They will get the knowledge of various types of menus and the principles involved in their planning.

CO5: The students will get the knowledge of the process of standardization of recipes and related definitions

CO6: The students will be able to define the concept of portion size and its significance in food service institutions & utilization of leftover foods.

CO7: The students will understand the concept of management, its essentiality, principles and techniques for effective execution in catering establishment.

FUNDAMENTALS OF COMPUTER SCIENCE

CO1: They will get to know what are computers, Application areas, Characteristics & limitations

CO2: Learn evolution of computers, Classification & generations of computers,

CO3: They will get to know about the Input & output devices. External Interfaces (Ports) &Concept of Device Drivers, Memory Devices.

CO4: They will get the knowledge of CPU their generations and performance parameters Primary (Main) Memories (RAM, ROM, Types of RAM and ROM

CO5: They will understand about the cache Memory, Register, Storage Evaluation Criteria, Memory Capacity)

CO6: The students will learn about the Secondary Storage Devices: (Magnetic Disk, Floppy and Hard Disk, USBs, Optical Disks CD-ROMs).

CO7: They will be able to learn about functions and classification of Operating Systems. Basic introduction to DOSUNIX/LINUX OS and Windows

CO8: They will study about HTML and Basic Tags of HTML

FUNCTIONAL FOODS & HEALTH FOODS

CO1: Students will get to know about the scientific basis for the development of functional food and nutraceuticals that area of high demand in both the national and international markets in recent years

CO2: They will understand the importance, health benefits, quality assurance and probiotic in various dairy and nondairy products.

CO3: They can illustrates about the prebiotics and be familiar with applications in food industry.

CO4: They can understand definition, chemistry, sources, metabolism and bioavailability, effect of processing, physiological effects, effects on human health and potential applications in risk reduction of diseases, perspective for food applications for the following:Polyphenols: Flavonoids, catechins, isoflavones,tannins,Phytoesterogens, Phytosterols, Glucosinolates, Organo sulphur compounds,Other components – Phytates, Protease

SEMESTER 3

BASIC DIETETICS

CO1: They can describe the term Nutrition Care Process and develop basic skill of assessing the nutritional status of different age group

CO2: Students will be able to understand the relationship between diet therapy and therapeutic diet

CO3: They can develop effective skills to explain the therapeutic modification of diet

CO4: Students can describe Therapeutic Diets as well as different Routine Hospital Diets used for patients according to specific disease

CO5: Students will understand the importance and relationship of the interaction between nutrients and drugs

CO6: They will understand and explain different feeding techniques used to feed the patient

CO7: They can develop skills to assess the nutritional requirement of the patient

CO8: They will learn to develop effective skills to plan and prepare the diet of infant according to the age group

CO9: They will develop basic skill of assessing and counseling of different age group, use methods in clinical, classroom and community settings

FOOD SCIENCE

CO1: Students can discuss the effect of cooking on nutritive value of cereals.

CO2: They will get know about structure and composition, Nutritional value, Processing- Milling, polishing. Parboiling, flaking, parching, roasting, use in variety of preparations selection, storage and care of different cereals

CO3: They can describe the role of pulses in cookery, its composition and nutritional value, processing, soaking, germination. Cooking and fermentations: Toxic constituents of pulses, Lathyrism.

CO4: They will understand the composition of milk, properties and effect of heat, nutritional importance, milk processing, milk products

CO5: They will learn about nutritive value, importance, classification and toxins in nuts and oil seeds

CO6: They will learn about nutritional importance, composition, Types, Smoking point and Role of fat/oil in cookery

CO7: They will understand about classification, Composition and Nutritive value, Storage, cooking of vegetables, changes during cooking and effect of heat, acid and alkali. Importance in human nutrition

CO8: They will learn about classification, coffee, tea, cocoa, fruit beverage etc. processing composition and preparation.

FOOD MICROBIOLOGY

CO1: The students will get to understand basic concepts of food microbiology and its relevance to everyday life.

CO2: The students will be able to know how intrinsic and extrinsic factors affect the growth and survival of microorganisms in foods

CO3: The students will know about the spoilage. contamination sources, types, effect on the following

CO4: Students will understand about the effect of environment over the health

CO5: They can develop an understanding of waste product handling.

CO6: Students will understand the impact of foods habits on planning of nutrition chart

CO7: Students will get to know about the association of microorganisms and food

CO8: Students will get aware about the role of important organizations in control, regulation and inspection of food.

ENVIRONMENTAL SCIENCE

CO1: Students will get to know about the true nature of Environment

CO2: They will learn about the inter-relationships of living and non-living matrices

CO3: Students will get scientific knowledge about chemistry of pollution, its abatement and treatment technologies

CO4: Students will understand the social impact on environment and vice-versa

FOOD LAWS & SAFETY

CO1: The students will understand the principles and methods of quality control and assurance in foods

CO2: They can enumerate the principles and functions of governing bodies.

CO3: They can identify the major food laws that are applied to protect food from hazards to ensure food safety

CO4: Students can be able to describe the principles for risk assessment of chemicals in Food.

CO5: The students will learn to describe the principles Safety evaluation of heat treatments and related processing techniques.

SEMESTER 4

THERAPEUTIC NUTRITION

CO1: They can describe the disease and use the knowledge while planning diet for such patients

CO2: The students can develop basic skills to understand, apply and assess the patient suffering from obesity, cardiovascular, kidney, diabetes, cancer, liver diseases and plan the modified diet accordingly

CO3: The students can understand and explain the diseases and guide the dietary modification required in the disease in clinical and community settings

CO4: The students can describe the various metabolic diseases and use the knowledge while planning diet for such patients

CO5: The students will develop the skills to use the knowledge of modifying the diet according to the disease condition of the patient

CO6: They will understand and explain the health hazards of these addictive behaviour conditions and aware the people about the condition in both clinical and community settings

FOOD SCIENCE AND PRESERVATION

CO1: The students will be able to classification, Composition and nutritive value, Selection, storage, uses and nutritional aspects of meat, fish and poultry, spoilage of fish.

CO2: Students can define structure, Composition & Quality of eggs. Classification of egg & egg products, its nutritive value

CO3: Understand the role of baking product cookery

CO4: They can learn about nutritive value ,Properties, form of sugar and liquid sweetness caramelization, hydrolysis, crystallization indian confectionery

CO5: They will able to understand the role of food additives in cookery

CO6: They will understand the role of food flavors in cookery

CO7: They will understand the importance of food preservation & food adulteration

JOB TRAINING AND MANAGEMENT OF DIETS

CO1: The students will get aware of the availability in stores of each food items & their related products

CO2: Students are able to plan nutritionally adequate and appropriate modified diet according to physical activity and income group

CO3: Students will able to plan nutritionally adequate and scientifically appropriate therapeutic diets for various disease conditions.

CO4: The students can get the basic principles & practical aspects during dietary advice.

CO5: The students can understand the role & responsibilities of nutrition counselor imparting nutrition knowledge to all vulnerable group.

QUALITY CONTROL IN FOOD INDUSTRY

CO1: The students will able to learn about objectives, importance and functions of quality control in food industry.

CO2: The students will able to learn about Concepts of quality management: Objectives, importance and functions of quality control.

CO3: The students will able to learn about various Food Safety organizations dealing with inspection, traceability and Labeling issues, International food standards.

CO4: They will understand the purpose of hazard analysis and critical control point

CO5: They will describe general concept about food quality management &improvement in the food industry.

CO6: They will understand knowledge of the key functional areas of the food service institutions.

ASSESSMENT OF NUTRITIONAL STATUS

CO1: Students can demonstrates and explain various methodologies and tools used to determine nutritional status at different ages of life, related indicators.

CO2: They can enumerate various biochemical methods to determine nutritional status.

CO3: Students can demonstrate various dietary approaches to assess nutritional status.

CO4: The students can elaborate various clinical tools and parameters for the assessment of nutritional status.

CO5: The students can enumerate the concept of food and nutrition security at national and global context.

SPORTS NUTRITION

CO1: The students can enumerate various approaches to the fitness and health & learn the guidelines for maintenance of health & fitness.

CO2: The students will be able to introduce the nutritional requirements of physical exercise and effect of specific nutrients on work performance and physical fitness.

CO3: The students can elaborate the sports specific macro and micro nutrients requirements.

The students can illustrate the role and use of various supplements and ergogenic aids used in sports.

SEMESTER 5

ADVANCED DIETETICS

CO1: They will be able to understand the relationship between diet therapy and therapeutic diet

CO2: They will develop effective skills to explain the therapeutic modification of diet

CO3: They will understand the relationship of dietician with health and develop skills required in nutritional counseling

CO4: The students can describe therapeutic Diets as well as different routine hospital diets used for patients according to specific disease

CO5: The students can describe the disease and use the knowledge while planning diet for such patients

CO6: The students will be able to enumerate the diseases, its symptoms and modify the diet to fulfill the nutritional requirement of the patient and planning the modified diet accordingly

COMMUNITY NUTRITION

CO1: Describe the different areas of Nutrition & Dietetics and its role and relationship with health in national development

CO2: They will develop effective skills to understand, aware and plan & prepare the diet of the age group suffering from malnutrition

CO3: They will develop effective skills to understand and enumerate the concept nutritional disorders and aware the community about different nutritional problems

CO4: The students will able to develop basic skill of assessing the nutritional status of different age group

CO5: The students will use the knowledge in guiding about methods which can be used to improve the nutritional quality of food to the public in clinical, classroom and community settings

CO6: The students will develop basic skills to understand, apply and assess the patient suffering from diseases, explain the importance of immunization and describe the food borne infection.

RESEARCH AND BIOSTATICS

CO1: The students will be able to understand the basic concept of statistics.

CO2: The students will be able to summarize data and present it using tables and graphs.

CO3: The student will be able to understand the meaning, uses applications, practical approach and guidelines for the use of various measures of central tendency.

CO4: They will be able to differentiate between sample and population variance and standard deviation.

CO5: The students will be able to define the basic sampling methods and how to use sampling methods to choose data.

FOOD PACKAGING

CO1: The students will be able to describe the term food packaging and enumerate the functions, concept, packaging environment, packaging material in detail

CO2: They will understand different types of packaging material used by food industry and their importance with the purpose, precautions

CO3: The students will be able to develop effective skills to understand and explain the methods of packing radiation stabilized food

CO4: They will be able to enumerate the term dehydrated products

CO5: They will be able to explain the process of packaging of dehydrated food products

CO6: They will be able to learn the skills of packing finished food products.

CO7: They can explain different procedure i.e. package selection criteria, labeling and mandatory provisions that need to be followed in food packaging.

PRODUCT DEVELOPMENT AND SENSORY EVALUATION

CO1: The students will be able to explain different criteria’s for the performance of sensory evaluation test

CO2: They will be able to enumerate the term sensory test and explain different sensory test used to evaluate the food acceptability

CO3: They will be able to understand the steps involved in new food product development

CO4: They will be able to explain and apply the procedure and stages involved in food product development

SEMESTER 6

CLINICAL NUTRITION AND DIETETICS

CO1: The students will be able to describe the term therapeutic diet and learn the importance of application of therapeutic diet in different conditions.

CO2: They will be able to understand the relationship between diet therapy and therapeutic diet

CO3: The students will be able to develop effective skills to explain the therapeutic modification of diet

CO4: They will be able to understand and explain the diseases and guide the dietary modification required in the disease in clinical and community settings

CO5: They will be able to develop basic skills to understand, apply and assess the patient suffering from diseases and plan the modified diet accordingly

NUTRITION MANAGEMENT DURING EMERGENCIES

CO1: They will be able to demonstrates a holistic knowledge base and understanding of the nature of important nutritional problems and their prevention and control for the disadvantaged and upper socio-economic strata in society

CO2: They will be able to enumerate the effect of the symptoms, causes, major deficiencies andcommunicable diseases & related problems on nutritional status and nutritional and dietary requirements.

CO3: The students will be able to identifies the causes /determinants and consequences of nutritional problems in society

CO4: They will get familiar with various approaches to nutrition and health interventions, programmes and policies

INTERNSHIP /TRAINING

CO1: Internship will provide opportunity to translate learned knowledge and skills in practice in clinical setups.

PROJECT

CO1: The purpose of project work is to provide the students' academic training to design a need based research plan in the field of nutrition, its execution, making inferences and report writing

Course Outcome of M.Sc. Nutrition & Dietetics

SEMESTER 1

NUTRITIONAL BIOCHEMISTRY

CO1: The students will be able to describe membrane structure, its composition & the process of transport across cell membranes.

CO2: The students will get to know about Acid, Base and its regulation in human body.

CO3: The student will be able to manifests about the various aspect of carbohydrate metabolism, transport of glucose across various cells, its cellular metabolism & regulation of carbohydrate metabolism at substrate, enzyme, hormonal & organ level and disorder associated with it.

CO4: The students will be able to demonstrates various aspects of lipid metabolism, its transport, cellular metabolism, regulation at substrate, enzyme, hormonal & organ level and associated disorders.

CO5: The students will get the knowledge of various aspect of protein metabolism and associated disorders.

CO6: The students will be able to: Describes various intermediary metabolic cycles.

CO7: The student will be able to: Describes various aspects of biochemistry of Nucleic acids.

CO8: The students will be able to impart knowledge of enzymes and related metabolic aspects.

ADVANCED NUTRITION –I

CO1: The student will be able to introduces the basis human nutritional requirements and recommendations through the life cycle

CO2: They will be able to demonstrates body composition and related terms

CO3: They will be able to enumerate the major concepts underlying the energy.

CO4: They will be able to describe the nutritional significance of carbohydrates and changing trends in dietary intake

CO5: The students will be able to manifest nutritional significance of proteins in the body.

CO6: They will be able to enumerate the common health effects associated with lipids.

CO7: They will be able to demonstrate the physiological and metabolic role of macro minerals.

CO8: They will gain in-depth knowledge of the physiological and metabolic role of fat-soluble vitamins and their importance in human nutrition

CO9: The students will be able to describes the role of nutrition in special conditions

NUTRITIONAL MANAGEMENT-I

CO1: They will be able to explain how to evaluate the nutritional status of an individual.

CO2: They will be able to plan, implement and evaluate nutritional care based on the assessment.

CO3: They will be able to explain exchange list and method for planning of nutrition chart

CO4: They will be able to define eating disorders and plan for the nutritional management of these disorders.

CO5: They will be able to demonstrate the various defence mechanisms in the body.

CO6: They can explain the relationship between nutrition and infection

CO7: They will be able to elaborate on the principles involved in the nutritional and dietary management of different disease disorders

CO8: They will be able to plan different modes of feeding.

PHYSIOLOGY

CO1: They will be able to demonstrate the body systems.

CO2: They will be able to explain the structure of cell, cell cycle and cell division and can describes the cell functions.

CO3: They will be able to explain the composition of blood and its role in our body and exhibit about various blood groups and anemia.

CO4: They will be able to explain the functions of the respiratory system, explain the difference between internal respiration and external respiration and will be able to list and explain various respiratory volumes and tell how they are used to diagnose respiratory problems.

CO5: They will be able to illustrate the structure and describe the functions of different parts of the digestive systems.

CO6: They will be able to explain the non-excretory functions of the kidneys and will be able to describe the medical aspects related to the abnormal or non-functioning of the kidney, such as dialysis and renal transplant.

CO7: They will be able to comprehend the implications of functional interrelationships n a diseased body.

FOOD MICROBIOLOGY & BIOTECHNOLOGY

CO1: They will be able to introduce the basic concepts of food microbiology and its relevance to everyday life.

CO2: They will be able to perform how intrinsic and extrinsic factors affect the growth and survival of microorganisms in foods

CO3: They will be able to illustrates the spoilage. contamination sources, types, effect on the following: Asepsis, cereals grains, pulses and meals, flours, bread, cake and bakery products, pasta, macaroni and tapioca.

CO4: They will be able to explain the spoilage, contamination sources, types, effect on the following: Asepsis, removal of microorganisms, general types of microbial spoilage, spoilage of fruit and vegetable juices, eggs, poultry and milk.

CO5: They will be able to enlists all the Good manufacturing practices, , Food control agencies Microbiological criteria for foods

SEMESTER 2

RESEARCH METHODOLOGY & BIOSTATISTICS

CO1: The students will be able to demonstrate scientific approach and know the processes of research.

CO2: They will be able to enumerate the competence for selecting methods and tools appropriate for research topics.

CO3: They will be able to demonstrate difference among the different types of research and exercise to be based on actual research papers published in accredited journals

CO4: They will be able to enumerate the competence for selecting methods and tools appropriate for research topics

CO5: They can describes the importance of sampling and types with suitable examples

CO6: They will be able to reproduce the concepts of statistical measures of central tendency, dispersion, variability and probability

CO7: They will be able to indicate the results of statistical analysis of data of correlation and regression

CO8: They will be able to illustrate how to interpret the results of analysis variance

ADVANCED NUTRITION –II

CO1: The students will be able to enumerate the physiological and pharmacological actions of water-soluble vitamins and their importance in human nutrition.

CO2: They will be able to identifie the sources of nutrients and explain the functions of each nutrient

CO3: They will be able to explain the effects on health of deficiency and excess of each nutrient

CO4: The students can lists the importance and role micro mineral in the body

CO5: They will be able to explain the causes and consequences of excessive intake and deficiency of ultra trace elements

APPLIED FOOD SCIENCE AND PRODUCT MODIFICATION

CO1: They will be able to enumerate the functions, concept, objectives, measurement scales, basic sensory test in detail

CO2: The can perform and apply the different types of sensory evaluation used by food experts and their importance with application

CO3: They will be able to describe effective skills to understand and explain the methods of packing radiation stabilized food

CO4: They will be able to enumerate the ways of increasing energy density of food

CO5: They will be able to demonstrate effective skills to understand and use methods of fermentation, germination, malting in product development

CO6: They will be able to enumerate the uses and benefits of different food ingredients that can be used in the development of health foods

CO7: The students will be able to illustrate the different types of packaging material used by food industry and their importance with the purpose, precautions

CO8: The students can perform methods of fermentation, germination, malting in product

development

NUTRITIONAL MANAGEMENT –II

CO1: The students will be able to illustrate the different long term complications related patients.

CO2: They will be able to enumerate the effect of the various endocrine organs related diseases on nutritional status and nutritional and dietary requirements.

CO3: The students will be able to display the etiology, symptoms, as well as, complications of various forms of heart diseases and can explain the treatment management and prevention of disease with emphasis on behaviour modification

CO4: The students will be able to demonstrate the causes of the disease and symptoms produced, can elaborate on the principles involved in the nutritional and dietary management of these disorders

CO5: They will be able to list of foods that can be given and those avoided in these disease conditions

NUTRITION IN EMERGENCIES

CO1: The students will be able to demonstrate a holistic knowledge base and understanding of the nature of important nutritional problems and their prevention and control for the disadvantaged and upper socio-economic strata in society

CO2: They will be able to enumerate the effect of the symptoms, causes, major deficiencies andcommunicable diseases & related problems on nutritional status and nutritional and dietary requirements

CO3: They will be able to identifie the causes /determinants and consequences of nutritional problems in society

CO4: The students will get familiar with various approaches to nutrition and health interventions, programmes and policies

CO5: The students will be able to introduce the etiology, physiologic and children with developmental disabilities

INTERNSHIP

CO1: Internship will provide opportunity to translate learned knowledge and skills in practice in clinical setups.

SEMESTER 3

NUTRITION MANAGEMENT-III

CO1: They will be able to counsel the patients on the basis of deficiencies

CO2: They will be able to elaborate and classify adverse food reactions, differentiate between food allergies and food intolerance.

CO3: They will be able to describe the etiology, clinical manifestation, metabolic aberrations and complications, linked with adverse food reactions

CO4: They will be able to illustrate the effect of the various pulmonary diseases on nutritional status and nutritional and dietary requirements

CO5: The students will be able to elaborate the physiological, hormonal and metabolic changes during different disease and can describe nutritional support required for these stress conditions

CO6: The students will be able to highlight nutrient drug interactions, can describes the effect of nutrients and food on drugs and the effect of drugs on the nutritional status and can identify the clinical significance and risk factors associated with nutrient drug interaction and can enlists handy guidelines for safe and wise use of drugs

PUBLIC NUTRITION AND HEALTH

CO1: They will be able to describe public policies and sectors relevant to nutrition and health

CO2: The students will get education about health, its determinants, indicators and health care delivery system of the country

CO3: The students will be able to explain the dynamics of population, its transition, structure, consequences of population policy and fertility behaviour on it

CO4: They will be able to enumerate the concept of food and nutrition security at national and global context

CO5: The students will be able to demonstrate and explain various methodologies and tools used to determine nutritional status at different ages of life, related indicators and determinants

CO6: They will be able to elaborate etiology, prevalence, clinical manifestation, preventive and therapeutic measures of major nutritional problems of the country.

CO7: They will be able to illustrates national food, nutrition, health policies and programmes

CO8: The students will be able to: Describes various types of approaches and strategies for improving nutritional status and health conditions of people of the country with a fuscous on programmatic options and food based interventions.

CO9: The students will be able to explain economics of health and malnutrition and its impact on

national development.

FOOD SERVICE MANAGEMENT

CO1: The students will be able to introduce the term food service industry, objectives and can demonstrate and explain the principles, types of food service institutions

CO2: They will be able to determine the different types of theories & approaches related to food service management

CO3: They will be able to manifests effective skills to understand and explain the methods of packing radiation stabilized food

CO4: They will be able to enumerate the term management and principles, functions, roles & responsibilities of leader, can illustrate and differentiate among different tools of management

CO5: They will be able to describe the skill to explain the term personnel management

CO6: They will be able to enumerate principles involved in quantity food purchase, inventory management, can introduce the term financial management

CO7: They will be able to elaborate the importance of hygiene and sanitation in preparation and serving area

FOOD PACKAGING TECHNOLOGY

CO1: The students will be able to describe food packaging, its role, need, principles of developing safe protective food packaging, various aspects of designing and testing of packaging materials and safety assessment of packaging materials

CO2: They will be able to illustrate the students about food packaging system, its different form and types for different kinds of foods

CO3: They will be able to explain different types of packaging materials uses for packaging different types of foods

CO4: The students will be able to highlight the students about various latest technologies and advanced equipments used in food packaging

FOOD PROCESSING & PRESERVATION TECHNOLOGY

CO1: The students will be able to describe the storage and quality of plant product

CO2: They will be able to explain the processing of ready to eat and newer methods of thermal processing

CO3: They will be able to describe the food irradiation and its principles

CO4: They will be able to enumerate the various methods of drying and its importance in food products

CO5: They will be able to explain the importance of chemical preservatives and its uses

DISSERTATION/PROJECT

CO1: The purpose of the project is to provide the student with training in academic research and acquisition of practical skills, including the design of a research project, planning of experiments, dealing with practical problems, recording of, presenting and analyzing data and writing the scientific reports.

SEMESTER 4

FUNCTIONAL FOODS AND NUTRACEUTICALS

CO1: The students will be able to introduce the scientific basis for the development of functional food and nutraceuticals that are of high demand in both the national and international markets in recent years

CO2: They will be able to elaborate the importance, health benefits, quality assurance and probiotic in various dairy and nondairy products.

CO3: They will be able to illustrate about the prebiotics and be familiar with applications in food industry

CO4: They will be able to highlight thorough understanding about the health effects

CO5: They will be able to explain the role of specific nutrient

MANAGEMENT OF HEALTH AND FITNESS

CO1: The students will be able to demonstrate effective skills to assess nutritionals status of human and describe holistic approach to health management and fitness including diet, aerobic and anaerobic exercises

CO2: The students can impart the education on impact of aerobic exercises on health of cardiovascular and respiratory systems

CO3: The students will be able to illustrate the students about different types of fuels utilized by different type of exercises with varied intensity and duration

CO4: The student will be able to: enlists the importance of water and electrolyte balance in human body

CO5: They will be able to explain the effect of nutrition on work, performance and physical fitness and the pros and cons of commercial nutritional supplements

CO6: This subject can reproduce skill of the student for prescription of various types of exercises in different disorders conditions at different life stages for fitness

CO7: The students will be able to: Formulate dietary guidelines for fitness and health

DISSERTATION/PROJECT (Continued from 3rd Semester)

CO1: The purpose of the project is to provide the student with training in academic research and acquisition of practical skills, including the design of a research project, planning of experiments, dealing with practical problems, recording of, presenting and analyzing data and writing the scientific reports.

Course Outcome B.Sc Neuro Physiology Technology

SEMESTER 1

Subjects:

1. **Neuro-Anatomy I**
   CO1 Describe neuron – its structure and classification.
   CO2 Explain neurolgia.
   CO3 Classification of nervous system.
   CO4 Differentiate between cerebrum and cerebellum.
   CO5 Define brainstem and parts of brainstem with suitable diagram.
   CO6 Describe blood supply of brain.
   CO7 Identify spinal nerves.
   CO8 Classify meninges and their importance.

2. **Neuro-Physiology I**
   CO1 Functions of nervous system.
   CO2 Draw the neuron structure and enumerate its properties.
   CO3 Classification of nervous system.
   CO4 Differentiate between ascending and descending tracts of spinal cord.
   CO5 Enumerate pyramidal and extra pyramidal tracts.
   CO6 Describe lobes and functions of cerebral cortex.
   CO7 what are synapse? Structure types and properties.
   CO8 Compare sensory and motor cortex.
   CO9 Underline functions of cerebellum.

3. **Neuro Pathology**
   CO1 Explain nerve with its gross and micro pathology.
   CO2 Describe microscopy of bone.
   CO3 Identify different types of bones and its gross pathology.
   CO4 Define muscle and its types.
   CO5 Explain gross and micro pathology of muscles.
   CO6 Draw the structure of bone.
   CO7 Diagram of neuron with explanation of its function.

4. **Communication skill and personality development**
   CO1 Introduction of communication.
   CO2 Describe types of communication.
   CO3 Importance and principles of communication.

CO8 Identify nerve tissue with its composition and metabolism.
CO9 Name chemical mediators of nerve activities.

4. **Fundamentals of computer science**
   CO1 Classification and generations of computer.
   CO2 Describe evolution of computers.
   CO3 Explain characteristics and limitations of computer.
   CO4 Identify application areas of computers.
   CO5 Express data representation in computer memory.
   CO6 Describe generations and performance parameters of CPU.
   CO7 Differentiate between RAM and ROM.
   CO8 Describe types of secondary storage devices.
   CO9 Define types of software and languages of software and applications.
   CO10 Classification and functions of operating system.

SEMESTER 3

Subjects:

1. **Neuro-Anatomy III**
   CO1 Describe tracts of cerebellum.
   CO2 Identify various functional areas of cerebral cortex.
   CO3 Explain functions of cranial nerves.
   CO4 Describe brain vascular supply.
   CO5 Draw parts of brainstem.
   CO6 Name foramens of skull.
   CO7 Compare pia and arachnoid mater.

2. **Neuro-Physiology III**
   CO1 Explain functions of medulla.
   CO2 Describe the process if neural transmission.
   CO3 Identify different reflex.
   CO4 Compare skeletal and cardiac muscle.
   CO5 Supply of peripheral nerves of limb
   CO6 Draw midbrain with explanation.
   CO7 Enumerate functions of hypothalamus.
   CO8 Describe neuromuscular junction.

3. **Basic of EEG**

CO1 Define EEG.
CO2 Explain activation procedures of EEG
CO3 Describe waveforms of EEG
CO4 Frequency and amplitude of EEG waveform.
CO5 Identify sharp waves and spikes in EEG.
CO6 Compare between fits and seizure.
CO7 Define epilepsy.
CO8 Demonstrate types of epilepsy.
CO9 Explain hyperventilation in EEG.
CO10 Describe effect on EEG in different age group.

4. **Basics of EMG and NCV**

CO1Define EMG and its types.
CO2 Describe NCV of both limbs.
CO3 Explain different types of needle electrodes used in EMG.
CO4 Amplitude and frequency of EMG waveform.
CO5 Enumerate muscle artifact in EMG.
CO6 Understand variation in F- wave.
CO7 Compare types of electrode used in NCV.
CO8 Describe common artifacts in NCV.
CO9 Frequency and amplitude of NCV waveform in lower and upper limb.
CO10 Define conduction block.
CO11 Differentiate types of neuropathy.

5. **Environmental sciences**

CO1 Explain multidisciplinary nature of environmental studies.
CO2 Describe importance of natural resources.
CO3 Compare renewable and non renewable resources.
CO4 Enumerate ecosystem.
CO5 Explain biodiversity and its conservation.
CO6 Identify types of pollution.
CO7 Describe major reasons of air pollution.

SEMESTER 4

Subject:

1. **Instrumentation of EEG-I**
   - CO1 Describe types of photosensitive response.
   - CO2 Explain bandwidth of EEG
   - CO3 Enumerate effect of analog and digital filters on biological signals.
   - CO4 Define pattern reversal.
   - CO5 Explain use of headphone in BERA.
   - CO6 Compare between checker board VEP and goggle VEP.
   - CO7 Describe stroboscope and its application.
   - CO8 Define impedance and electrode impedance.
   - CO9 Name different amplifiers.

2. **Instrumentation of EMG &NCV-I**
   - CO1 Explain bandwidth of EMG signals.
   - CO2 Describe AC and DC voltage.
   - CO3 Enumerate insertion activity in brief.
   - CO4 Identify spikes in EMG.
   - CO5 Define compound action potential.
   - CO6 Compare sensory and motor response.
   - CO7 Calculate brachial plexus in NCV.
   - CO8 Differentiate between neuropathy and myopathy.

3. **Pharmacology related to neurophysiology and clinical practice**
   - CO1 Describe pharmacokinetics.
   - CO2 Define pharmacodynamics.
   - CO3 Understand pharmacology.
   - CO4 Explain adverse effect of drugs.
   - CO5 Name drugs used in tuberculosis.
   - CO6 Name sleep inducing drugs.
   - CO7 Describe therapeutic uses of drugs.

4. **Patient management and clinical practice**
   - CO1 Understanding proper labeling of patient investigation.
   - CO2 Describe basic of history taking.
   - CO3 Explain patient preparation for procedure.
   - CO4 Enumerate pre procedure medication and post procedure care.
   - CO5 Dealing with OPD procedure and patient attending.

CO6 Explain steps to perform in during procedure emergency.
CO7 Handling of aggressive patients during procedure.
CO8 Compare OPD and IPD patients.

SEMESTER 5

Subjects:

1. **EEG and EMG machines and clinical practice I**
   CO1 Explain visual evoked potential.
   CO2 Describe types of stimulation.
   CO3 Understanding basic of receiving patient in procedure room.
   CO4 Preparation for admission.
   CO5 Discuss impedance parameters in different procedures.
   CO6 Amplification of signals.
   CO7 Enumerate different montages in EEG.
   CO8 Observing maintenance of machines.

2. **EEG, EMG in different disease states I**
   CO1 Explaining common neurological diseases.
   CO2 Describe epilepsy and its common types.
   CO3 Define meningitis and its causes.
   CO4 Enumerate encephalitis and its causes.
   CO5 Identify brain abscess.
   CO6 EEG waveform in coma patient.
   CO7 Describe generalized and focal seizure.
   CO8 Explain tongue bite in status epilepticus.

3. **Research and methodology and biostatics**
   CO1 Understanding tabulation of data.
   CO2 Describe measure of central tendency.
   CO3 Describe measure of variability.
   CO4 Explain measure of probability and standard distribution.
   CO5 Understanding sampling techniques.
   CO6 Understanding collecting data.

SEMESTER 6

Subject:

1. **EEG & EMG in different disease state II**
   CO1 Explaining metabolic and toxic disorders.
   CO2 Describe head injury.
   CO3 Enumerate cerebrovascular disease.
   CO4 Define dementia.
   CO5 Understanding coma of various causes.
   CO6 Identify neurophysiology equipments.
   CO7 Define slow waves and its conditions.
   CO8 Describe stages of sleep.
   CO9 Discuss dreaming stage in sleep EEG.

2. **EEG and EMG machines and clinical practice- II**
   CO1 Describe standard electrode placement.
   CO2 Define calibration, damping, sensitivity, gain and noise.
   CO3 Explain high frequency and low frequency parameters.
   CO4 Understanding mechanical control during recording.
   CO5 Describe sources of artifact and methods of elimination.
   CO6 Discuss method of notation and labeling the recording.
   CO7 Explaining recording techniques and parameters.
   CO8 Identify different montages in different disease state.

Course Outcome of B.Sc Microbiology

Semester 1

Introduction to microbial world

CO1:Recall History of development of Microbiology and contribution of eminent scientists.

CO2: Enumerate diverse microbial forms. Classification and characterization of different microbial forms and pathogenicity of different microorganisms.

CO3: Identify different fields of microbiology. Differentiate between algae, fungi and protozoa.

Mycology and Phycology

CO1: Classify different types of algae

CO2: Identify life cycle and general characteristics of different algae

CO3: Recognize economic importance of different algae

CO4: Classify different types of fungi

CO5: Identify life cycle and general characteristics of different fungi

CO6: Recognize economic importance of different fungi

Cell Biology I

CO1: Differentiate between prokaryotic and eukaryotic cell.

CO2: Describe metabolic processes of cells

CO3: Identify and compare structure, including cell organelles and cell movement

CO4:Identify transport mechanism of cell

Chemistry I

CO1:Discuss basic concepts of organic chemistry. Enumeration of atomic structure.

CO2:Underline concepts of stereochemistry, and thermodynamics

CO3:Basic Organic Chemistry and Chemistry of Biomolecules

CO4:Stereochemistry with emphasis on conformity and chirality

Communication skill and personality development I

CO1: Demonstrate Listening Comprehension like Speeches, development of Interviews Conversation Skills, Greetings and introducing oneself and Framing questions

CO2:Reading Comprehension like Simple narration and Stories, Simple Passages

CO3:Demonstrate Pronunciation

CO4: Reproduce Syllable and Stress

CO5: Recognize Writing Comprehension like Letters: types, format, style, Précis Writing

SEMESTER 2

Bacteriology

CO1: Discuss bacterial cell - organization and structure, nutrition, reproduction and sterilization.

CO2: Identify Eubacteria: Morphology, pathogenesis and economic importance of gram negative, gram positive bacteria; Archeae; Methanogens and thermophiles.

CO3: Demonstrate pure culture isolation techniques.

Virology

CO1:Recall viral taxonomy, Classification and nomenclature of viruses.

CO2: Differentiate Structure and salient features and viral genomes of different viruses

CO3:Discuss Isolation, cultivation of viruses and applications of virology.

CO4:Report definition, structure and cycle of T4 and lambda phage.

CO5:Discuss mechanism of viral replication and oncogenic viruses

CO6: Recognize Transmission, prevention and control of viral diseases

Cell Biology II

CO1: Demonstrate tools and techniques of cell biology. Differentiate different types of microscopic techniques

CO2: Enumerate methods of Cell signaling, cell Cycle, cell death and renewal

CO3: Identify types of cancer and mutations

Chemistry II

CO1: Discuss inorganic chemistry emphasising Chemical Bonding and Molecular Structure. Differentiate ionic and covalent bonding.

CO2: Discuss basic concept of physical chemistry emphasising on Ionic Equilibria

CO3:Discuss Basic Organic Chemistry and Chemistry of Biomolecules with classification and differentiating different carbohydrates, Amino Acids, Peptides and Proteins

Fundamentals of Computer Science

CO1: Recall basic concepts of computers, its definition, Application areas, Characteristics & limitations etc

CO2:Enumerate Computers Architecture /Organization

CO3: Identify hardware of computer setup

CO4: Recognize different software and languages used in computers

CO5: Demonstrate different networks used in computers

SEMESTER 3

CO1 Microbial Ecology

CO1: Discuss microorganisms habitat and their role in biogeochemical cycles and succession pattern

CO2: Differentiate different Terrestrial Environments and cycles

CO3: Indentify different types of microbial interactions

Molecular Biology I

CO1: Discuss nucleic acid and genome structure

CO2: Discuss key experiments establishing-The Central Dogma

CO3: Differentiate prokaryotic, viral and eukaryotic DNA

CO4: Indentify the replication and repair mechanism used in nucleic acid

Genetics and Genomics I

CO1: Discuss mendelian genetics.

CO2:Correlate cell structure and genetics

CO3: Identify environmental effects on phenotypic expression

CO4: Determine Mutation and sex determination

Microbial Physiology and Metabolism I

CO1: Discuss Microbial growth, measurement of microbial growth and effect of temperature on growth

CO2: Identify mechanism of Microbial transport

CO3: Discuss metabolism

Environmental Science

CO1:Recognize The Multidisciplinary nature of environmental studies

CO2: Recognize Natural Resources and associated problems.

CO3:Differentiate between Renewable and non-renewable resources

CO4:Identify different types and its components of Ecosystems

CO5:Estimate Biodiversity and to deduce methods for its conservation

CO6: Discuss pollution levels, causes and prevention

CO7: Discuss social issues on environment and human population

SEMESTER 4

Plant pathology

CO1: Estimate host pathogen interactions emphasising on Microbial Pathogenicity and genetics of plant diseases.

CO2: Determine Plant diseases- types and discuss its control measures

CO3: Identify important diseases caused by fungi

CO4: Recognize important diseases caused by bacteria, virus, phytoplasmas and viroids

Molecular Biology II

CO1: Discuss transcription and translation.

CO2: Differentiate between eukaryotic and prokaryotic transcription and translation

CO3: Identify regulation mechanism of transcription and translation in prokaryotic organisms

Genetics and Genomics II

CO1:Discuss Genetic analysis and genome dynamics like conjugation and transposable elements

CO2:Discuss Genomics, emphasising on human genome project

CO3:Recall basic concepts in bioinformatics and proteomics

CO4:Infer genomic analysis

CO5: Discuss population and evolutionary genetics

Microbial Physiology and Genetics

CO1:Discuss structure function and classification of different enzymes

CO2:Recognize enzyme regulation mechanisms

CO3:Explain Microbial energetics emphasising on EMP pathway, ED pathway, PP pathway, and TCA cycle

CO4:Describe nitrogen fixation including genetics of nitrogen fixation and it regulation

SEMESTER 5

Immunology

CO1:Recall history o immunology

CO2:Describe cells and organs of the immune system

CO3: Describe structure and function of antigens and antibodies

CO4: Explain Major histocompatibility complex, complement system, immune response

CO5:Describe Immunological disorders and demonstrate techniques

Food and Dairy Microbiology

CO1: Describe Food as a substrate and discuss methods of food preservation

CO2:Explain Microbial spoilage and fermented foods

CO3:Identify Food borne diseases and food intoxication

CO4:Identify Food sanitation practices and describe water potability

Biotechnology

CO1: Explain Introduction to biotechnology and basic DNA cloning

CO2:Discuss Construction of genomic libraries

CO3:Explain DNA sequencing and product of DNA technology

Research methodology and Biostatistics

CO1:Discus basic of statistics

CO2:Describe Tabulation of Data

CO3:Discuss Measure of Central Tendency

CO4:Describe measure of variability

CO5:Explain Probability and Standard Distributions.

CO6:Explain samplinf techniques and describe health indicators

SEMESTER 6

Medical Microbiology

CO1:Identify Microflora of human body and discuss host pathogen interaction

CO2:Demonstrate Sample processing, diagnostic tools, antimicrobial agents

CO3:Discuss Symptoms, pathogenesis, transmission, prophylaxis and control of - Bacterial and protozoan diseases

CO4: Describe different Viral and fungal diseases

Industrial Microbiology

CO1:Discuss Introduction, fermentation and fermentors

CO2:Describe Overview on industrial fermentation- measurement of parameters, isolation of strains, media and ingredients

CO3: Explain Downstream processing

CO4: Explain Microbial production of industrial products

Recombinanat DNA technology

CO1: Tools of recombinant DNA technology emphasising on host and enzymes, and vectors

CO2: Discuss Gene delivery methods and amplification of nucleic acids

CO3: Discuss Analytical methods and DNA typing

Course outcome of B.Sc Operation Theater Technology

BOTT 1st SEM:

ANATOMY:

CO1: Define anatomy and its subdivisions.

CO2: Describe cell and its organelles and various types of tissues.

CO3: Enumerate anatomy of human body, function of organ and organ system and diseases related to them.

CO4: Identify and classify bones and joints and common movements of joints with range of motion.

CO5: Identify bones of axial & appendicular skeleton with important bony landmarks.

CO6: Identify and explain in brief parts of respiratory system with salient features of lungs.

CO7: Describe quadrants of abdomen and identification of abdominal and pelvic organs.

CO8: Describe Surface Anatomy of main structures and vessels.

PHYSIOLOGY:

CO1: Describe cell structure, function and tissue formation and repair.

CO2: Enumerate Blood formation, grouping and coagulation mechanism.

CO3: Explain Structure and function of organs and organ system in normal human body.

CO4: Define Muscle movements,Muscle tone, Physiology of contraction and Maintenance of posture.

CO5: Demonstrate White Blood Cellcount, Red Blood Cellcount.

CO6: Determine different BloodGroups.

CO7: Enumerate Functions of Neuroglia & Neurons.

CO8: Explain Functions of brain, Spinal cord, cranial and spinal nerves

CO9: Assess Functions of respiratory organs, Pulmonary ventilation, lung Volumes & capacities and Mechanism of respiration.

BIOCHEMISTRY:

CO1: Demonstrate methods of specimen collection and Use of preservatives in specimen collection.

CO2: Explain Preanalytical and analytical variables.

CO3: Enumerate Basic concepts of apparatus, units, equipments and volumetric analysis in the clinical biochemistry.

CO4: Describe Use care and maintenance of Waterbath, Oven and Incubators.

CO5: Demonstrate general tests of biomolecules, carbohydrates and proteins.
CO6: Demonstate Normal urine and abnormal constituents of urine.

MICROBIOLOGY:

CO1: Describe uses of different instruments and microscope used in microbiology lab.

CO2: Demonstrate different staining methods and identify the organisms based on staining.

CO3: Explain Physical and chemical Methods of Sterilization.
CO4: Interpret different Culture Media & Transport Media.
CO5: Demonstrate Sample collection and transport Methods.
CO6: Enumerate Aerobic and anaerobic Bacterial Culture Techniques.
CO7: Describe Principle and techniques of biochemical Test.
CO8: Explain Antimicrobial susceptibility testing by different methods.

PATHOLOGY:

CO1: Describe the concept Normal cell and its functions
CO2: Enumerate Various types of microscope.

CO3: Explain composition and functions of blood.
CO4: Demonstrate Collection & preservation of blood for various hematological investigations.
CO5: Describe Various anticoagulants, their uses, mode of action and their merits & demerits.
CO6: Demonstrate Various methods of estimation of Hb involved and standardization of instrument.
CO7: Explain Quality assurance in hematology.
CO8: Assess Morphology of normal blood cells and their identification.
CO9: Describe ESR & Factors influencing ESR and various procedures for its estimation.

COMMUNICATION SKILL AND PERSONALITY DEVELOPMENT

CO1: Define basic concept of communication, its need in current scenario & how communication is important for a doctor or a medical person..
CO2: Interpret Word formation strategies.
CO3: Enumerate Vocabulary building: Antonyms, Synonyms, Affixation, Suffixation, One word substitution.
CO4: Describe Letter Writing, Paragraph writing and Comprehension.
CO5: Demonstrate Project Writing: Features, Structure.
CO6: Interpret Parts of speech & their uses for correct writing.

CO7: Know basic knowledge of medical terminology.

CO8: Understand presentation skills & art of best presentation to present during conference (National & International).

BOTTT 2nd SEM:

ANATOMY

CO1: Describe Parts of urinary system,Salient gross features of kidney, urinary bladder, ureter and urethra.

CO2: Explain Parts of male and female reproductive system with salient gross features of testis & uterus, ovary and fallopian tube.

CO3: Explain List of the endocrine glands and their position,Hormones produced by each endocrine glands.

CO4: Explain Names of lobes of Cerebrum and cerebellum, Cerebrospinal fluid and its circulation,.Names of cranial nerves, spinal nerve, autonomic nervous system. Parts of brainstem..Neuron- structure and classification, .Classification of the nervous system, .Definitions of central, peripheral and

CO5: Explain and Identify Sensory organs, Skin's functions, .Parts of eye and its structure. Parts of ear- external, middle and inner ear and content.

CO6: Explain Spermatogenesis & oogenesis,Ovulation fertilization,PlacentaFetal circulation.

PHYSIOLOGY

CO1: Describe Functions of skin, eye, ear, nose, tongue and Alterations in disease.

CO2: Enumerate Functions of pituitary, Pineal gland, Thymus, Thyroid, Parathyroid, Pancreas and alteration in diseases.

CO3: Explain Immunity, Formations of T- Cells and B- Cells, Types of Immune response, Antigens, Cytokines and Antibodies.

CO4: Demonstrate White Blood Cell count and Red Blood Cell count.

CO5: Determine Clotting Time and Bleeding Time.

BIOCHEMISTRY

CO1: Describe Maintenance, Care and cleaning of laboratory glassware.

CO2: Demonstrate Use care and maintenance of Water Distillation Plant and Deionizers, Refrigerators, Centrifuges, Laboratory Balance and Direct Readout Electrical Balances,Colorimeter, Spectrophotometer and pH Meter and its Calibration.

CO3:Explain CONVENTIONAL AND SI UNITS USED IN THE LABORATORY.

CO4: Describe and demonstrate Proper method of dilution of a solution or a laboratory sample and Serial dilutions of samples.

CO5: Describe Basic concept of acids, bases salts and indicators.

MICROBIOLOGY:

CO1: Explain basic concept about Immunity Antigen & Antibody

CO2: Describe Antigen antibody reactions I, Antigen antibody reactions II.

CO3: Enumerate Morphology, Classification & infection caused by Microorganisms (in brief).

CO4: Describe and demonstrate Hospital infection control ,Health care associated infection ,Biomedical waste management ,Monitoring of air quality in Operation theatre ,Sterilization of Operation theatres ,Infection control measures in ICUs,Central sterile supplies department

PATHOLOGY:

CO1: Describe Physical and chemical properties of body fluid sample such as CSF, pleural fluid & Ascitic fluid and their normal values.

CO2: Describe Basic Transfusion medicine in detail..

CO4: Perform Biomedical waste management.

FUNDAMENTALS OF COMPUTER SCIENCE:

CO1: Describe What are computers, Application areas, Characteristics & limitations

CO2: Interpret data representation in computer memory (numbering systems).

CO3: Explain Basic concept of Word Processing Software.

CO4: Define and interpret Input & output devices, External Interfaces (Ports) & Concept of Device Drivers, Memory Devices.

CO5: Enumerate Secondary Storage Devices: (Magnetic Disk, Floppy and Hard Disk, USBs, Optical Disks CD-ROMs) and to study the MS PowerPoint.

CO6: Describe Functions and Classification of Operating Systems.

BOTT 3rd SEM:

INTRODUCTION TO OT TECHNOLOGY

CO1: Explain Explain Zoning of OT, OT disinfection & sterilization : Cleaning, carbolization, fumigation, fogging,Theatre clothes, PPE, Lead aprons, goggles,Scrubbing, gowning, gloving,Handling of sterilized articles in OT. OT table, OT lights, image intensifier: Handling and maintenance

CO2: Explain Compressed gas cylinders: Types, sizes, parts,Colour coding different gas cylinder and pipe line system,Cylinder storage and handling :Things to remember,Medical gas pipe line system and outlets,Diameter index safety system (DISS), and PISS,Safety devices in pipe line and cylinders,Air compressor,Oxygen concentrator :working principal their uses and care

CO3: Describe Anaesthesia masks and Oxygen masks,Pressure Regulators , pressure gauges, Flow meters, Flow restrictors

CO4: Explain Hypoxia and hypoxemia,Clinical signs of hypoxemia,Goals of oxygen therapy,Oxygen therapy devices, Types of oxygen masks,Evaluation of patients receiving oxygen therapy,Hazards of oxygen therapy.

CO5- Explain Routes of drug administration,Intra muscular and Intra Venous techniques,Handling of sterilized syringes and needles,Preparation , dilutions and labeling of drugs,Disposal of sharps, used syringes, needles.

CO6: Describe Type of fluid (Crystalloids & Colloids),Steps to prepare I.V. drip,Indication of specific fluid and their complications,Basics of periop fluid requirements

CO7: Various types of blood groups and blood products ,Pre transfusion Checks, cross matching,Transfusion reactions.

MEDICINE RELEVANT TO OPERATION THEATRE- Part A

CO1: Explain Signs and symptoms *Diabetes Mellitus*,complications,Drugs used in diabetes mellitus,Anaesthetic implications of DM,Causes of DM- Type- 1, Type -2,Gestational diabetes,Prevention,Management -Lifestyle, Medications.

CO2: Explain Signs and,symptomsManagement,Causes,Pathophysiology,Diagnosis,Prevention.

CO3: Describe *Signs and symptoms* IHD,Diagnosis, Management,Anaesthetic implications,Risk factors,Pathophysiology,Prevention

CO4: Difine Diseases associated with obesity,Anaesthetic problems in obese patients,Ideal body weight, adjusted body weight in obese,Classification of obesity,Effects on health,Causes,Management

CO5: Explain Differences between adult and geriatric medicine,Aging-associated diseases,Dose adjustments in elderly patients,Pharmacology,Practical concerns.

CO6: Explain Managements of various types of shocks during pregnancy,Types and Causes of pregnancy,shocks.

CO7: Explain-Signs and symptoms of COPD,Cause of COPD,Management,Pathophysiology,Diagnosis , Lungs function tests in COPD,Prevention.

ENVIRONMENTAL SCIENCE:

CO1: Understand the true nature of Environment.

CO2: Describe chemistry of pollution, its abatement and treatment technologies.

CO3: Understand the social impact on environment and vice-versa.

BOTT 3rd SEM:

MEDICAL ETHICS

CO1: Explain- Definition, goal, scope,Ethical behavior and conduct

CO2: Describe Introduction to Code of Conduct

CO3:Define Basic Principles,Confidentiality.

CO4: Explain- Malpractice and Negligence,Malpractice and negligence of patient / treatment,Rational and irrational drug therapy

CO5:Enumrate Introduction to consent,Types of Consents,Autonomy and Informed Consent,Rights of Patients.

CO6: Explain--Care of terminally ill patients,Euthanasia and its norms in India,Organ transplantation,Will and Norms.

CO7: Describe Medicolegal case and types,Release of medical information,Unauthorised disclosures ;Retention of medical records,Records and documents related to MLC,Ownership of medical recordsMedicolegal aspects and relation to Consumer Protection Act.

BOTT 4TH SEM:

BASIC ANAESTHESIA TECHNOLOGY

CO1: Explain Basic Boyles Machine and its functions,Modern anesthesia machine: Parts and safety features,Hanger and Yoke system, Pin index, Pressure regulator , Pressure gauge,Flowmeters, Vaporisers, scavenging system,Ether bottle, Flow meter assembly, Vaporizers-Types, Hazards, maintenance, Filling and Draining

CO2: Define Classification of breathing systemOpen, Semi closed and Closed Circuits, Mapleson breathing systems ,Jackson and Rees system-Bain's circuit,Closed circuit: Components, advantages, disadvantages

CO3: - Define Method of cleaning and disinfection of anesthetic equipments.Handling and maintenance of various equipments used in OT,Setting of alarm limits in monitors and ventilators,Electrical faults, earthing,.

CO4: Describe Pulse oxymeter / Plethysmograph,EtCO2 Monitor / Capnograph,NIBP, IBP, Temperature, ECG,FiO2,Transcutaneous oxygen monitor, inhalational agents analyser, BIS, Nerve stimulator

CO5: Describe Basic Life Support (Circulation, Airway, Breathing) ,Drugs used in CPR, Defibrillator, AED,Components of emergency tray / trolley,Anaphylactic reaction

CO6: Explain- Parts of airway (nasal/oral) : Types, Sizes, insertion techniques, indications for use,Supraglottic Airway devices : LMAs – Types, sizes, method of insertionEndotracheal tubes: Types, sizes, parts, Armoured ETT, RAE tubes,Double lumen tubes, Bronchial blockers, Laryngeal tubes.

CO7: Define Pre-anaesthesia check list,Drugs and equipments to be kept ready before anaesthesia ,Pre operative preparation of patient, Drugs and doses for Premedication,Management of pre operative room and PACU,Transportation Techniques of patient in conscious, semi conscious and unconscious patient to and from operation theatre.

CSSD PROCEDURE ,CLEANING AND STERLIZATION

CO1: Explain Layout, aim, functioning of CSSD,Cleaning, Carbolization and Maintenance in CSSD,Handling sterilized articles in CSSD,Quality assurance , Indicators of sterilization control

CO2: Describe Methods of instruments cleaning, cleaning agents, detergents, mechanical washing, ultrasonic cleaner,Lubrication and inspection of instruments,Care of micro surgical and titanium instruments

CO3: Explain Principal of sterilization and disinfection,Different methods of sterilization and disinfection,Critical, semicritical, noncritical medical devices,Recent advances in the methods of sterilization,Sterilization of various types of ET Tube, Laryngoscopes and other anaesthesia equipments.

CO4: Define Types of Autoclave Machine,Autoclave able instruments/Equipments,Steps of sterilization by autoclave machine.

CO5: Explain-Availability of ETO Machine according to volume,Autoclave able instruments/Equipments ,Preparation of equipments/instruments sealed packets, stamping etc,Loading and working of ETO Machine,Methods of checking for efficiency of sterilization.

MEDICINE RELEVANT TO OPERATION THEATRE Part B

CO1: To cover Signs and symptoms of anaemia,Causes,Diagnosis,Treatment,Epidemiology,Anaesthetic implications.

CO2: Explain Signs and symptoms,Causes,Diagnosis,Treatment,Adjustment of drugs and doses.

CO3: Explain Causes of chronic liver disease,Physical signs, Recognition, Treatment,Risk factors for various liver diseases,Adjustment of drugs and doses.

CO4: Explain-Physical characteristics of newborn ,Internal physiological changes at birth Neonatal Nursing Care and feeding of newborn,Potential diseases of neonatal period ,Calculation of weight in children,Calculation of drug dosage in children.

SURGICAL EQUIPMENTS AND MACHINERY

CO1: Describe Basic principal of surgery,Principles of Asepsis,Clean / aseptic technique,Medical and surgical asepsis.

CO2: Explain Different types of bandages and their applications,Surgical Needle & Needle holders,Types of suture material,Techniques of stitching and removal of stitches.

CO3: ExplainInstruments used for cleaning and draping for a surgical procedure,Classification of General surgical instruments,Urological surgery Instruments,Orthopedic surgery instruments,Obstetrics and Gynecological surgery instruments,Reconstructive surgery instruments,Laparoscopic instruments used for Cholycystectomy and Laparoscopic gynaecology procedures

CO4: Explain- Intra-operative & postoperative problems and complications of general surgery.Trolley for emergency caesarean section.Care and maintenance of Para surgical equipment (Cautery, OT lights, OT Table)Esmarch bandage, simple tourniquet, pneumatic

tourniquet uses, care and maintenance,Major abdominal incisions.Positioning of patient for different operations.Laparoscopic gynecology procedures,Surgical Consideration in TURP and PCNL ,Surgical management in major burns,Surgical management of Fracture, Joint replacement and arthroscopy,Surgical management of endoscopies, laryngectomy and cochlear implant,Management of PPV and perforating eye injury.

CO5: Explain Foot operated, electrically operated suction apparatus, its General Principles, uses and care, suction pressures for different situations,Central pipeline suction, colour coding,Suction catheters – sizes, colour coding,Yaunkauer suction.

CO6: ExplainTypes of electrocautery, leads,Uses, precautions, handling

Advanced Anaesthesia Technology

CO1: Explain-Types of Anaesthesia,General anaesthesia/sedation techniques /MACRegional anaesthesia techniques, Topical anaesthesia, Bier's block,TIVA: Definition, Drugs used,Balanced anaesthesia, Anaesthesia triad, History of anaesthesia, Evolution of modern anaesthesia,Dye allergies, Monitoring, Equipment options in the MRI.

CO2:Define Different type of laryngoscope and bladesDescription of plain and cuffed endotracheal tubes (ETT),Preparation & technique for ETT intubation ,Complications of endotracheal intubation,Other type of Endotracheal tubes, armoured tubes, Ring, Adair and Elwyn tubes (RAE), Microlaryngeal tubes,LMA, Other supraglottic airway devices (SAD), Ambu bag, Contents of Intubation tray / trolley,Tracheotomy tubes: Indications, Procedure, Protocol for tracheotomy decannulation,Double lumen ETT, Bronchial blockers.

CO3: Explain Clinical Monitoring, Peripheral pulse locations,Multi parameter monitor: Normal values, Arterial blood pressure - NIBP, IBP, Manual BP,monitoring,Electrocardiogram monitoring : significance,SpO2, EtCO2, Temperature, FiO2,Monitoring of Anaesthesia ventilator: Paw, MV, RR, Alarms,Neuromuscular monitoring , BIS

CO4: Enumrate Different routes of drug administration.Drugs used during General anaesthesia and Regional anaesthesia, Intravenous anaesthetic agents: Uses and complications.Inhalational anaesthetics: Uses and complications,Neuromuscular blockers and Reversal agents,Analgesics : Types and complications,Pre- medication: indication, Types of drugs used for premedication, Doses and side effects,Infusion pumps,Vasopressors, Antiarrhythmic, Hypotensive drugs,Anticoagulant drugs.

CO5: Describe Operation room Ventilators : Types, Settings , modes,Complication in patients on Ventilators,General care of patient on Ventilator, Ventilator alarms,Disinfection and sterilization of ventilators,NIV, HFJV

CO6: Explain Various ECG leads, their placement ,Normal ECG,Circulatory shock and its management.Drug interactions with antidepressant drugs,Electroconvulsive therapy (ECT), drug effects on seizure duration,Hemodynamic responses and appropriate treatment,Cardiac stents, Angiography, PCI

BOTT 5TH SEM:

OPERATION THEATRE TECHNOLOGY-APPLIED

CO1: Explain- Pre operative preparation of the patient, check list,Premedication : Drugs / doses, NPO protocol, Consent / Informed Consent, -ASA grading

CO2: .Explain Proper maintenance of monitors and accessories

CO3: Explain- Rapid sequence intubation, Cricoid pressure,BURP manoeuvre, adjuvants used during difficult intubation,Premedication, induction, intubation, maintenance, reversal, emergence, recovery,Setting of anaesthesia trolley / tray, cockpit drill,Preparations and techniques for emergency anaesthesia,Low flow anaesthesia/ circle system/ closed circuit,Stages of anaesthesia,Indication of general anaesthesia,Nasogastric tube insertion technique in awake and unconscious patient

CO4: Explain-Complication of General Anesthesia,Anaphylactic reaction, Hypothermia prevention,Adverse drug reactions, malignant hyperthermia,Aspiration pneumonitis : Prevention

CO5: Explain -Sedation and monitoring during diagnostic procedures,Radio opaque dyes and uses, contrast studies,Endoscopy,Angiography,Introduction to MRI : MRI compatible machine, monitor,Biopsy specimens,Nuclear medicine studies, Ultrasonography.

RESEARCH & BIO STATISTICS

CO1: Describe Introduction of statistics.

CO2: Define Raw Data, the array, frequency distribution, Basic principles of graphical representation.

CO3: Describe Introduction: Uses, applications and practical approach,Definition and calculation of mean for ungrouped and grouped data,Meaning and calculation of mode,Comparison of mean and mode.

CO4: Describe Uses, applications and practical approach,The range, average deviation or mean deviation,The variance and standard variation,Calculation of Variance and standard variation for ungrouped and grouped data,Properties and uses of variance and standard deviation

CO5: Descirbe Probability and standard Distribution.

CO6: Explain Uses, applications and practical approach,Criteria for good samples,Application of Sampling in Community,Sampling Methods, Sampling and Non- Sampling errors,Sampling variation and tests of significance.

CO7: Explain Importance of health indicator,Indicators of population, morbidity, health services,Calculation of rates and ration of health.

Operation Theatre Technology – Clinical

CO1: Describe Introduction to Operating Room, Physical facilities available in OT, Layout of operation theatre, Zoning,Maintenance of Temperature, humidity. Laminar air flow, Air circulation,Peripheral support areas,OT hazards : Potential source of injury to the care giver and patients,Special procedure rooms.

CO2: Explain Classification of different surgical equipments, Surgical instrumentation fabrication, Uses and maintenance of Powered surgical instruments, Things to remember while handling instruments,Preparation of surgical trolley.

CO2: Describe maintenance of specialized surgical equipments like electric cautery, laparoscopes, Laser microsurgery equipments,Endoscopes,Handling of delicate instruments

CO3: Describe Suture Material and Needles.

CO4: Describe Role of OT technician during surgery ,Setting up of operation room and table,Setting up of trays and trolleys for various surgical procedures,Part preparation for surgical procedures, Positioning and draping according the surgical procedures,Incisions for various surgical procedures,Requirement of suturing materials for different surgeries.

Regional Anaesthesia Techniques

CO1: Describe Role of Regional anaesthesia (RA) in Modern Anaesthesia and Pain management.

CO2: Explain Spinal & epidural Anaesthesia.

CO3: Explain Supraclavicular block: indications, preparation, complications,Wrist Block: Indications, preparation, complications,Interscalene block,Axillary block,Catheter technique for prolonged analgesia

CO4: Explain-Femoral Nerve Block : Indications, preparation, complications,Lateral Femoral cutaneous nerve block: Indications,Ankle block: indications, preparation, complications,Sciatic nerve block.

CO5: Explain Local anaesthetics (LA) TypesXylocaine, bupivacaine, ropivacaine,Concentrations and volume used for different techniques,Preparation of different concentrations of LA,Adjuvants used in regional anaesthesia-clonidine, dexmeditomedine, dexamethasone,soda bicarbonate, Fentanyl, Adrenaline,Complications of Local anaesthetics

BOTT 6TH SEM:

Anaesthesia for Specialty Surgeries

CO1: Explain-Premedication,Checklist,Induction of a patient, Reinforced Endotracheal tubes,Postioning in neuro surgery,Air embolism,Reversal of the patient, Transferring to I.C.U. / Ward,Special investigation - CT, Angiography and MRI

CO2: Explain- Complications During Orthopedic procedures-fat embolism Haemorrhage,Tourniquet application and complications,Radiation hazard, Preventive measures.

CO3: Explain Burns -types and initial management-anaesthetic challenges,RAE tubes,Complications during revascularization and its management, Recognition of compartment syndrome.

CO4: Explain-Differences between a pregnant and a non pregnant lady, Risks for anaesthesia.-difficult airway, supine hypotension syndrome,Check list,Regional vs General anaesthesia,Induction / maintenance and recovery.Resuscitation of the new born, APGAR score,Emergencies - manual removal of placenta , Ruptured uterus,Ectopic Pregnancy, Amniotic fluid embolism.

CO5: Explain -Check listPremedication ,Paediatric circuit, Induction, laryngoscope types,, Intubation - Securing the ETT,Reversal & extubation,Monitoring,complications and management,Transferring management,Pain management

CO6: **Explain CardioThoracic Anaesthesia.**

CO7: **Describe** Anaesthesia / sedation during, Endoscopy,Cath Lab,Radiology -CT,MRI. Compatible equipments for MRI suits,ECT,Essential monitoring during MAC

CO8: **Explain Day care Anaesthesia.**

Basic Intensive Care

CO1: **Describe** General ICU Care and Monitoring.

CO2: Explain Infection Control ,Nutrition in ICU, Acid Base Balance.

CO3: **Define Intensive Care in ICU and Mechanical Ventilation.**
CO4: Explain -Head injury and Trauma Care: Glasgow Coma Scale (GCS), care of head injury patient,Poly trauma patient,Blood and blood products ,Transfusion reactions & complications,Massive transfusion

Operation Theatre Technology - Advanced

CO1: Explain- Management of poisoning, COPD, snakebite.,Gastric lavage, insertion of nasogastric tube,Ventilation of patient in crisis,Mouth to mouth, Mouth to mask, Ambu bag,Short term ventilation/Transport ventilator,Monitoring during transport,Management of Hypotension, hypoxia, cyanosis, burns.

CO2: Explain- Introduction to different neuro surgery and positions required for them, Preparation of patient and trolley, special instruments used in neurosurgery, Emergency neuro surgery, required instruments

CO3: Explain- Introduction to different Gynecological surgeries,Instrument required for different Gynecological surgeries,Preparation and Positions for different Gynecological surgeries,Introduction to different Obstetric surgeries,Instrument required for different Obstetric surgeries,Preparation and Positions for different Obstetric surgeries,Preparation of trolley for emergency LSCS,Laparoscopic Gynaecological surgery

CO4: Describe Urology Surgery, Orthopedic Surgery,Ophthalmic Surgery.

CO5: Explain - Introduction to Plastic and reconstructive surgeries,Preparation and Positions for different Plastic and reconstructive surgeries,Instrument required for different Plastic and reconstructive surgeries

CO6: Explain- Introduction to Otorhinolaryngologic surgeries,Preparation and Positions for different ENT surgeries,Instrument required for different Otorhinolaryngologic surgeries,Cochlear implant, endoscopy

CO7: Describe Thoracic, Cardiac and Vascular Surgery.

Post Anaesthesia Care Unit (PACU)

CO1: Explain- Definition of PACU,Set up,Staff/patient ratio,Monitoring in PACU,Pipeline oxygen, suction,Patient positioning,Special ICU beds

CO2: Describe Criteria for Shifting patient out of PACU,Aldrete score / Modified Aldrete score,Five vital signs,Discharge criteria,Transfer of patient to and from PACU

CO3: Describe Common complications & its management in PACU.

CO4:Define Management of postoperative pain- Analgesics,Narcotics, NSAID (im/iv), Local anaesthetics infiltration and through catheters, Transdermal fentanyl patches

CO5: Explain -Mortality -myocardial infarction, arrhythmias, hypoxia, electrolyte imbalance, respiratory depression, pulmonary oedema,

Course Outcome of M.Sc Operation Theatre Technology

SEMESTER 1

ANATOMY

CO1: Explain -Human body- Overview & Organization, Anatomical terminology.
CO2 Describe –Major skeletal muscles of the Head, Neck, Thorax, Abdomen & upper and lower limbs.
CO3: **Explain** -Regional and surface anatomy of the shoulder, axilla, and upper limb
CO4 **Describe** -Regional & surface anatomy of the hip, thigh, legs
CO5: **Explain** -Regional & surface anatomy of Intercostals space, Pleura, Bony thoracic cage, Rib , Sternum
CO6: **Describe** -Regional & surface anatomy of Nose, Larynx, Trachea, Lungs, Bronchial tree
CO7: **Explain** -Regional & surface anatomy of heart, chambers of heart,
Regional & surface anatomy of Valves of heart, Major arteries and veins of heart, Pericardium.
CO8: **Explain** -Regional & surface anatomy of Pharynx, Esophagus, Stomach, Small Intestine, Large Intestine, Spleen, Liver, Gall Bladder, Pancreas.
CO9: **Explain** -Regional & surface anatomy of Spinal Cord, Meningeal CoveringRegional & surface anatomy of brain.
CO10: **Define** -Regional & surface anatomy of Eyes, Ear, Tongue, Nose
CO11: **Describe** -Regional & surface anatomy of Kidney, Ureters, Urinary bladder,Urethra
CO12: **Explain** -Anatomy of the scrotum, Prostate gland, penis & testis.Epididymis, Ducts deferens, Inguinal canal, Seminal vesicles, Bulb urethral gland.
CO13: **Explain** -Anatomy of the ovaries, fallopian tubes, Uterus, Vagina and external genitalia; functions of ovary.

PHYSIOLOGY AND BIOCHEMISTRY

CO1: **Explain** -Introduction to the structure and function of cell organelles, Transport across cell membrane.Blood Propagation of nerve impulse, Muscle- properties-classification,excitation /contraction coupling.
CO2: Blood groups and Rh factor,Composition of blood, -Functions of the blood, plasma proteins,Function of hemoglobin,Detailed description about WBC-total count (TC), differential count (DC) and functions.Platelets formation and normal level and functions, Erythrocyte sedimentation rate (ESR)
CO3: Describe Cardio-Vascular System:
CO4: **Explain** -General organization, Mechanics of respiration, Definitions and normal values of lung volumes and lung capacities,Exchange of Gases,Respiratory Failure.
CO5: **Explain** -Kidneys: structure & function,Maturation - neural control- neurogenic bladder,Normal urinary output,Temperature Regulation, Circulation of the skin- body fluid-electrolyte balance
CO6: Describe Nervous system.

CO7: Describe Physiology of Thyroid, Parathyroid, Suprarenal glands, Pineal gland and organs with a minor endocrine function, Thyroid gland, Bulbourethral glands.

CO8: Explain Physiology of the Mouth, Salivary glands, Pharynx, esophagus, stomach, intestine, liver pancreas, biliary system & peritoneal cavity, esophagus, stomach, small intestine, pancreas & liver.
CO9: Describe Fluids and Electrolyte, Acid Base Balance.

CO10:Explain Carbohydrate, -Protein, Lipid, Vitamin, Minerals

CLINICAL PHARMACOLOGY

CO1: Describe Antisialagogues.
Co2: Explain Sedatives anxiolytics(Diazepam, Midazolam, Phenergan, Lorazepam, Chloropromazine, Trichlophos).
Co3:Enumrate Morphine, Pethidine, Fentanyl, Pentazozine, Nalbuphine, Butorphanol, Buprinorphine, Tramadol.
Co4: Describe NSAIDs.
Co5:Explain Ondansetron, Dexamethasone,Metoclopramide,
Co6: Define Prokinetics.
Co7: Define H2 Blockers and Proton Pump Inhibitors.
Co8: Explain Thiopentone,, Ketamine, Propofol, Etomidate
Co9: Define muscle relxent Depolarising - Suxamethonium, Non depolarizing -Pancuronium, Vecuronium, Atracurium, Rocuranium.
Co10: Explain Inhalational anaesthetics.
Co11:Enumrate Reversal agents(Neostigmine, Glycopyrrolate, Atropine,Nalorphine, Naloxone, Flumazenil)
Co12: Describe Local anaesthetics.
Co13:Explain all the Emergency drugs

CLINICAL PATHOLOGY AND MICROBIOLOGY

CO1: **Explain** -Cellular adaptation,Cell injury & cell death, Cellular response to stress and noxious stimuli, Reversible and irreversible cell injury,
CO2: **Describe** -Blood Groups,Blood Transfusion,Blood componentsBT,CT,Transfusion Reactions
CO3: **Explain** -General principles of microbial pathogenesis,Viral infections,Bacterial infections,Rheumatic heart disease,Fungal infections,Parasitic infections
CO4: **Explain** -Hospital waste disposals
CO5:Describe Hospital acquired infection and prevention
CO6: **Explain** -Hepatitis B, C, HIV/AIDS,Causes & prevention
CO7: Cover PPE(Personal Protective Equipments - list) Universal Precautions- indications

CO8: **Explain** -Methods of cleaning, Decontamination and Sterilization
CO9: **Explain** -Cover Sample collection, Labeling and sending to Lab

APPLIED PHYSICS AND COMPUTER

CO1: **Explain** Basic principle of electricity applied in OT, ICU, and CSSD.Concept of static electricity, charge, potential current power, resistance.AC /DCBasic principles of heat, concept of temperature its measurement, way of dispersion of heat.
CO2: **Explain-**Computer basics, I/O devices ,Different operating system, MS DOS ,Basic commands, MD, CD, DIR,TYPE and COPY CON commands, Networking , LAN, WAN,MAN(only basic ideas) ,Memories, RAM and ROM, Different kinds of ROM, kilobytes. -MB, GB their conversions
CO3: Describe Typing text in MS word.

CO4: **Explain**Using spell check and grammar option,Find and replace ,Mail merge ,inserting tables in a document.

CO5: **Explain** -Creating table in MS, Excel, Cell editing ,Drawing graphs and charts using data in excel ,Auto formatting ,Inserting data from other worksheets
CO6: **Describe** -Preparing new slides using MS-POWERPOINTInserting slides ,slide transition and animation , Using templates, Different text and font sizes
CO7: **Describe** -Slides with sounds, Inserting clip arts, pictures, tables and graphs, Presentation using wizards
CO8: Explain Introduction to Internet.

2 SEMESTER

BASIC MEDICINE AND MEDICAL ETHICS

CO1: Define Disorder of haematopoiesis ,anaemias ,iron deficiency anaemia

CO2:Describe Infections and Diseases.

CO3: Define Diseases of CVS ,CHF, Pulmonary Oedema, CAD, Peripheral vascular diseases (PVD).

CO4: Explain Disease of Respiratory system(Asthma, pneumonia, COPD, Restrictive Lungs Disease.)

CO5: Describe Kidney & Urinary Tract Diseases(Acute renal failure, Glomerulonephritis, Haemodialysis, Kidneytransplant, Urinary Tract Infection).

CO6: Define Liver and Biliary Tract Disease(Viral hepatitis, Alcoholism, Liver failure, Hepatic Coma).

CO7: Define Endocrinology and Metabolism.

CO8: Describe Medical Ethics.

CO9:Describe Malpractice,Types of medical malpractice.Negligence

CO10: Describe Introduction to Rational and irrational drug therapy,Clinical implication of rational drug therapy.Reason and Impact of Irrational use of drug therapy.

CO11:Define Consent,Different types of consents,Right of patients

CO12: Describe Care of terminally ill – Euthanasia.

CO13:Define What is Organ transplantation ,Successfully transplanted organs,Policies and procedures Of organ transplantation,Organ donor option.

CO14: Define Medical Legal Aspects of Medical Records .

BASICS OF ANAESTHESIA

CO1: DefineTechnical terms used in anaesthesia.

CO2: Describe Phase of GA(-Induction, Intubation, Maintenance, Reversal, Recovery).

CO3: Explain Drugs used during anaesthesia, their uses indication and contra indication.

CO4: Define Different drugs used for Premedication their doses, effects and side effects.

CO5: Explain I.V. Induction agent their doses, indication, contra indication and management

CO6: Describe drugs used for Neuromuscular blocks their doses, indication and contra indications.

CO7: Explain Drugs used for Reversal Agentstheir doses, indication and contra indication

CO8: Explain Steroids -their doses, indication and contra indication

CO9: Describe Drugs used as Analgesicstheir doses, indication and contra indicationOpioids / Non opiods Analgesics .

CO10: Explain Emergency drug used in OT and ICU Their uses, doses, indication and contra indication.

CO11:Define Different Airways .

CO12: Describe Suction Catheters – types, sizes, , techniques of suction.

CO13: Explain Laryngoscope – Types, Size of blades, Fiberoptic intubation / video laryngoscopy.

CO14: Describe Spinal and Epidural needle – sizes, colour coding, features, differences,Epidural Catheters

CO15: Explain Importance of OT Asepsis,Aseptic techniques, OT sterilization procedures

Basics of surgery

CO1: Explain Scrubbing Technique, Gowning Technique, Gloving techniques.

CO2: Describe Surgical terminology, Types of incision ,indications for the use of particular incision.

CO3: Explain Signs and symptoms of internal and external haemorrhage ,Classification of haemorrhage,Management of haemorrhage.

CO4: Define Types of tourniquets,Uses of tourniquet ,Duration of tourniquet application,Pneumatic tourniquet, application, Complication of tourniquet application.

CO5: Explain What is Wounds, Types of wounds, Wound healing, Treatment and complications of wound, inflammation,wound infections,Causes and treatment; -Incision and drainage of abscesses; Importance of personal cleanliness and aseptic techniques

CO6: Describe Skin preparation for invasive procedures,Surgical asepsis.

CO7: Explain Classification of surgical instruments and their uses.

CO8: Explain Suture Material: Types and uses.Different Suturing Techniques. Instruments used for suturing.

CSSD PROCEDURES, STERILIZATION PROCEDURES

CO1: Describe Layout and location of CSSD and its role in hospital functioning.

CO2: Explain Collection of used items from user area,Use of disinfectants Sorting and classification of equipment for cleaning purposes, sharps, blunt lighted etc,contaminated high risk items, delicate instruments or hot labile instruments.

CO3: Explain Use of detergents. -Mechanical cleaning apparatus,Cleaning instruments, Cleaning jars, receivers bowls etc. trays, basins and similar hand ware utensils.Cleaning of catheters and tubing,cleaning glass ware, cleaning syringes and needles.

CO4: Describe Materials used for wrapping and packing –Assembling pack contents. Types of packs prepared.Method of wrapping ,Use of indications to show that a pack of container has been through a sterilization process.

CO5: Describe Moist heat sterilization,Dry heat sterilization,EO gas sterilization,H202 gas plasma sterilization.

CO6: Explain Uses and maintenance of autoclaving machine.

CO7: Define Duties of CSSD Technician

BIO STATICS AND HOSPITAL MANAGEMENT

CO1:Explain Introduction to research methods,Variable in research,Reliability and validity in research,Conducting a literature review,Formulation of research problems and writing research questions

CO2:Describe Experimental and non experimental research designs,Sampling methods, data collection, observation method,Interview method, questionnaires and schedules construction.

CO3: Explain Ethical issues in research,Principles and concepts in research ethics-confidentiality and privacy informed consent,Writing research proposals,Development of conceptual framework in research.

CO4: Describe Introduction to statisticsClassification of data, source of data.

CO5: Describe Concept of probability and probality distributions- binomial probability distribution, poison probability distribution and normal probability distribution.

CO6: Explain Correlation-Karl person, spearman's rank correlation methods regression analysis, testing hypothesis-chi square test, student's test, NOVA.

CO7: Define Functions of Hospital administration,Modern techniques in Hospital management,Challenges and strategies of Hospital managementAdministrative Functions– Planning, Organizing, Staffing, Leading and Controlling Organizational Structure,Motivation and leadership.Designing health care organization

CO8: Explain Medical record, House-keeping services,Laboratory performance,Management of biomedical waste,Total patient care – indoor and outdoor,Nursing and ambulance resources,Evaluation of hospital services,Quality assurance,Record reviews and medical audit

3 SEMESTER

ANAESTHESIA DELIVERY SYSTEM & DEVICES

CO1: Explain Compressed gas cylinders, colour coding, Types of cylinders (E&H),Cylinder valves; pin index safety system (PISS), pressure regulator, safe handling of cylinders Gas piping system / Manifold Room / DISS,Recommendations for piping system, Alarms & safety devices,Oxygen Concentrator: Mechanism, functioning, maintenance,Liquid Oxygen

CO2: Describe in detail about Anaesthesia Machine.

CO3: - Explain General considerations: humidity & heat,Common components - connectors, adaptors, reservoir bag, expiratory valve.Methods of humidification.Classification of breathing system,Mapleson system – A, B, C, D, E, FJackson Rees system, Bains circuit,Non rebreathing valves - ambu valves,The circle system – Components, advantages, disadvantages

CO4: Explain Scavanging system – Role in Modern Anaesthesia Practice, types.

CO5: Describes Types OF Anaesthesia face masks,Airways – Types, Sizes,Laryngoscopes – Types,Endotracheal tubes - Types, sizes, Specialised ETT, Supraglotic Airway Device (SADs),Fixing, removing and inflating cuff, Checking tube position complications.Difficult Intubation Trolley / Tray

CO6: Describe Modes of ventilator,Working principles,Alarms and settings.

CO7: Explain Monitoring.

BASIC PROCEDURES AND TECHNIQUES

CO1: Explain Sizes, Colour Coding, Technique of i.v. cannulation, Preparation of I.V. drip, Types of fluids, Precaution during IV cannulation.

CO2: Describe Central Venous Cathetrisation And CVP.

CO3: Explain Arterial Cannulation.

CO4: Define Sellick manoeuvre, BURP Technique in intubation.

CO5: Explain different types of Bandaging And Splinting.

CO6: Describe Drainage Of Abscess.

CO7: Explain Foley Catheter Types, sizesInsertion Technique

CO8: Describe Nasogastric Tube Size, uses,Techniques of Insertion.

CO9: Explain Types of masks: Open and closed,Sizes,Technique of holding Anaesthesia mask,Triple airway maneuver.

CO10: Explain Oropharyngeal / Nasopharyngeal Airways

CO11: Describe Making Of Various Dilution Of Drugs.

CO12: Explain Baby Resuscitation Trolley.

PERIOP ANAESTHETIC TECHNIQUES, PREPARATIONS

CO1: Describe Types Of Anaesthesia.

CO2: Explain Pre anaesthetic assessment.History – past history - disease / Surgery / and personal history - Smoking / alcoholdrugs / medicationGeneral physical assessment, systemic examination – CVS, RS, CNSInvestigations – Haematological, Urine, ECG, Chest X- ray, Endocrine, Hormonal assays, Echocardiography, angiography, Liver function test, renal function tests,ASA grading - I, II, III, IV, V

CO3: Define Duties Of OT Technician In Pre Operatve Room.

CO4: Explain Pre Operative Checklist /Cockpit Drill.

CO5: Describe PACU, Discharge Criteria,Modified Aldrete Score,Five Vital Signs,PONV,Bladder Distension,Pain management.

PREPARATION FOR VARIOUS SURGERIES

CO1: Define Preparation of OT before surgery.

CO2: Explain Positions of patient for different surgeries.

CO3: Describe Handling of instruments,Cleaning of instruments,Maintenance of instruments

CO4: Explain Instrument Requirement for Common Surgical Procedures.

CO5: Describe Instruments for Obstetric and Gynecological surgeries

CO6: Describe Brief description of different Urological Surgeries,Preparation for different Urological Surgeries.Position for different Urological surgeries.

CO7: Brief description of different orthopedics Surgeries,Preparation for different orthopedics Surgeries,Position for different orthopedics surgeries,Instruments required for different orthopedics surgeries

CO8: Brief description of different Neurological Surgeries-Preparation for different Neurological Surgeries.Position for different Neurological surgeriesInstruments required for different Neurological surgeries

CO9: Describe Preparation for different Ophthalmology Surgeries,Position for different Ophthalmology surgeries,Instruments required for different Ophthalmology surgeries

CO10: Explain Various Otorhinolaryngologic Surgeries and Instruments required for them

CO11: Brief description of different Reconstructive Surgeries.

CO12: Brief description of different Thoracic, Cardiac, Vascular Surgeries.

VARIOUS EQUIPMENTS / ITEMS USED IN OT

CO1: Explain Different parts of Basic Boyle's apparatus,Functioning of Basic Boyle's apparatus,checklist of Basic Boyle's apparatus before use,Safety features in Basic Boyle's apparatus.

CO2: Describe Different parts of Modern Anaesthesia machine,Functioning of Anaesthesia WorkStation,Checklist of Modern Anaesthesia machine before use,Safety features in Modern Anaesthesia machine vs Basic Boyles Apparatus

CO3: Explain Colour coding medical gas Cylinders ,Types of medical gas cylinders,Handling and care of cylinders

CO4: Describe Uses of Resuscitators / Ambu Bag,Types of AMBU Bag according to Age groups,Things to remember while using AMBU Bag.

CO5: Explain Uses of Defibrillators,Types of defibrillators,Selection of charge for defibrillation, Position of Pads,Precaution during defibrillation .

CO6: Explain Rebreathing / Circle system.

CO7: Describe Types of Suction machine,Pressure setting for various requirements, Suction Catheter – Sizes, Colour coding

CO8: Define Pneumatic TourniquetTypes,Application, Complication.

CO9: Explain Diathermy Cautery machine,Types, Uses,Precautions

CO10: Explain OT Lights – Ceiling / Portable.

CO11: Describe Properties of OT Table,Functioning, Various Position,Hydraulic,Electric.

CO12: Define C Arm, Uses, Handling, Precaution.

CO13: Describe Uses of peripheral nerve stimulator,Handling,Precaution

CO14: Explain Air Conditioning system Laminar Flow, HEPA Filter, Humidity and temperature , Patient warming device,Fogger machine.

4 SEMESTER

ANAESTHESIA FOR SPECIALITY SURGERIES AND SITUATIONS

CO1: Explain Neuro anaesthesia in detail.

CO2: Explain Differences between a pregnant and a normal lady,Risks for anaesthesia,Precautions to be taken,Check list,Regional vs General anaesthesia,Resuscitation of the new born, apgar score,Preparation for emergency LSCS **Emergencies** Manual removal of placentaA.P .H,P.P.H,Ruptured uterus,Ectopic pregnancy.

CO3: Describe Check list for pediatric Anaesthesia,Premedication – modes, drugs, doses,Pediatric circuit ,Pain management

CO4: Explain Anaesthesia for adenotonsillectomy,Anaesthesia for mastoidectomy,Anaesthesia Bronchoscopy and oesophagoscopy,Nasal Intubation – Preparation and Technique

CO5: Describe Cardiac anaesthesia in detail,

CO6: Explain Anaesthesia outside the o.t.(Cath Lab,Radiology,E.C.T.,Risk and preventive measures).

CO7: Explain Day care anaesthesia.

CO8: Describe Geriatric anaesthesia.

CO9: Explain Resuscitation,Pre-op investigation / assessment,Circulatory management,Management of anaesthesia,Rapid sequence induction ,Cricoid pressure,Other problems.

CO10: DescribePulmonary function tests and lung volume,Bed side tests,Vitallograph,One lung Anaesthesia, Double lumen tubes, Bronchial blockers.

CO11: Explain Postoperative problems.

BASIC INTENSIVE CARE

CO1: Describe monitoring and diagnostic procedures in i.c.u.

CO2: Explain Care of unconscious patient ,Syringe pump / Infusion Pump uses, infusion rate.Vascular lines - arterial, venous line ,Radiography / USG,Physiotherapy - chest physiotherapy,Oxygen Therapy ,Sources of oxygen, Oxygen Delivery devices, Oxygen Toxicity, Monitoring Hypoxia

CO3: Describe Ventilator Associated Pneumonia (VAP),Prevention of infection in ICU.

CO4: Explain acid - base disorders and fluid balance

CO5: Describe Inotropic support ,Vaso dilator drugs.Vasopressor,Antiarrhythamic drugs,Bronchodilators,Sedatives & Hypnotic,Anticoagulant drugs.

CO6: Explain Head Injury,Glasgo coma score (GCS),AVPU Assessment,Fluid Resuscitation in Trauma,Polytrauma

CO7: Describe Grouping and transfusion,Whole blood, packed RBC,Plasma components and indication,Complication of Blood Transfusion,Anaphylactic reaction

CO8: Explain Basic respiratory parameters,Basic ventilators setting,Monitoring and alarms,Weaning process,Care of patient on ventilator,Suctioning of ETT / Tracheotomy tube

CO9: Describe NG tube insertion,Parenteral Nutrition, Types, Techniques, complications.Enteral Nutrition.

CO10: Explain Causes of cardiac arrest,Basic life support outside hospital,Triple Airway Manoeuvre,AMBU Bag,BLS Protocol for adult / children,BLS Protocol for infants,Chest compression technique,Use of AED / Defibrillator

Course Outcome of B.Sc Optometry

SEMESTER 1

General Anatomy

CO1: Able to enumerate different parts and systems of human body.

CO2: Different types of sensory organs of the body and their nerve supply.

CO3: Able to enumerate different glands of endocrine system and excretory system.

General physiology

CO1: Able to describe about cell division and functions of cell organelles.

CO2: Different types of muscles, bones and cartilages and transmission of nerve impulse.

CO3: Enumerate of functions of cardiac system, blood circulation, ECG, respiratory system.

CO4: Enumerate the function of different sensory organs such as ear, nose, eye, tongue.

Ocular anatomy, physiology and bio-chemistry

CO1: Enumerate the stages of eyeball formation, parts and functions.

CO2: Able to define the different parts of eyelid glands and eyeball layers.

CO3: Able to enumerate the anatomy of visual pathway and pupillary functions.

CO4: Able to describe the different types of extra and intra ocular muscles and its action and nerve supply.

CO5: Able to describe the lacrimal apparatus its dranaige system.

Physical and geometrical optics

CO1: Enumerate the brief idea about refraction, reflection, diffraction, polarization, interference and it's significant in visual system.

CO2: Able to identify the prism and measurement of power of prism.

CO3: Able to explain clinical significance of ray diagram and importance in astigmatism.

CO4: Able to do lensometry and identification of lenses.

SEMESTER 2

Ocular pathology and microbiology

CO1: Able to demonstrate fundamental knowledge and insight into general pathology and general medical disorders and how they can affect in the eye.

CO2: Classification of bacteria, fungi and viruses.

CO3: Basic understanding of gram positive and gram negative bacterias of ocular importance.

CO4: Elementary idea about sterilization techniques.

CO5: Able to know the culture media.

Ocular pharmacology

CO1: Basic idea of ocular pharmacology.

CO2: Routes of drug administrations.

CO3: Uses of Miotics, Mydriatics, Cycloplegics drugs and its side effects.

CO4: Classification and uses of antibacterial, antifungal, antiviral, anti-inflammatory, Anti-glaucoma, Anti-allergic and lubricants drugs.

Clinical examination of visual system

CO1: History taking and recording of visual acuity.

CO2: Cover- uncover, alternate cover test and ocular movements.

CO3: Recording of Intra-ocular pressure and syringing.

CO4: Field charting, slit lamp examination.

CO5: Ophthalmoscopy.

Visual optics-I

CO1: Light and its properties.

CO2: Various types of refractive errors.

CO3: Retinoscopy and its interpretation.

CO4: Simple and toric transposition.

SEMESTER 3

Ocular diseases

CO1: Able to identify different types diseases of eyelids, conjunctiva, cornea, sclera, crystalline lens, anterior segments and posterior segments.

Optometric instruments-I

CO1: Uses of different types of refractive instruments.

CO2: Keratometry.

CO3: Slit lamp examination.

CO4: Tonometry.

Visual optics-2

CO1: Able to describe the accommodation and convergence and its applications.

CO2: Clinical significance of strum's conoid in different types of astigmatism.

CO3: Basic idea about optical axis, visual axis, and angle kappa.

CO4: Able to define the keratoconus, progression and management.

CO5: Able to know the effective power of spectacles.

Public health and community optometry

CO1: Implementation of stages of diseases.

CO2: Dimensions and determinates and indicators of health.

CO3: Epidemiology, Prevalence, incidence and control and prevention of diseases.

CO4: Survey methodology, health education and health programs in India.

CO5: National program for control of blindness and vision: 2020.

CO6: Legal issues related to optometry.

SEMESTER 4

Ocular disease –II

CO1: Identification of glaucoma cases.

CO2: Identification of Disease of vitreous, retina and optic nerve

CO3: Ocular manifestation of systemic diseases.

CO4: Different types of ocular injuries.

Optometric instruments-II

CO1: Exophthalmometry,

CO2: Mannual and automated perimetry.

CO3: Pachymetry and A-scan.

CO4: OCT, Fundus camera and nerve fibre analysis.

Binocular vision and Orthotics-I

CO1: Knowledge of orthotics workup.

CO2: Grades of binocular vision and uses of synaptophore.

CO3: Suppression, Diplopia and Amblyopia and occlusion therapy.

CO4: Description of Nystagmus and management.

Investigations in clinical ophthalmology

CO1: Understanding and interpretation of visual acuity test, color vision test, contrast sensitivity test and glare testing.

CO2: Uses and limitations of slit lamp examinations, keratometry, corneal topography, specular microscopy, gonioscopy and tomography.

Contact lens-1

CO1: History of contact lenses and materials.

CO2: Corneal physiology, indication and contraindication of contact lenses.

1. Glossary of contact lenses, manufacturing technique and fitting assessments.

CO3: Base curve selection, Verification of contact lens parameters.

CO4: Knowledge of cosmetic, Prosthetic and therapeutic contact lenses.

SEMESTER 5

Contact lens -2

CO1: Fitting assessment of RGP and soft cont lenses.

CO2: Care and maintenance of contact lens, complications and its managements.

CO3: Knowledge of different brands available in Indian market disposable, regular wear, extended wear, toric and scleral contact lenses.

Dispensing optics

CO1: Knowledge of spectacles lens materials such plastic, glasses.

CO2: Knowledge of spectacles frames.

CO3: Visual acuity chart standards.

CO4: Management of headache after using spectacles.

Binocular vision and orthotics-II

CO1: Knowledge of vision therapy.

CO2: Management of convergence insufficiency.

CO3: Classification and evaluation of strabismus and its management.

SEMESTER 6

Low vision aids

CO1: Identifications and prevalence of low vision cases in India.

CO2: Refraction of low vision patients.

CO3: Diseases responsible for low vision.

CO4: Knowledge of low vision aids.

Eye banking

CO1: Motivation for eye donation.

CO2: Prevalence of corneal blindness and needs of eye donation.

CO3: Methods of preservation techniques of corneal tissue.

CO4: Education of patients before and after eye donation.

Management of Operation Theatre

CO1: Basic idea of working in operation theatre.

CO2: Basic idea of asepsis.

CO3: Basic idea of anaesthetic agents.

CO4: Sterilization of operation theatre and surgical instruments.

CO5: Different types of instruments required for ophthalmic surgeries.

CO6: Biomedical waste management.

Occupational optometry

CO1: Occupational health and hygiene and safty.

CO2: Knowledge of factory act, ESI act and international bodies.

CO3: Vision screening and vision standards for railways, pilots, roadways, army and industry.

CO4: Adverse affects of electromagnetic radiations in eye.

CO5: Different types of occupational hazards and preventive measures.

Paediatric and geriatric optometry

CO1: Scope of paediatric and geriatric optometric.

CO2: Assessment of visual acuity in preschool children.

CO3: Different types of refractive error in children.

CO4: Diseases of old age.

CO5: Dispensing of glasses in old age and children's.

Course Outcome of M.Sc Optometry

SEMESTER 1

Binocular vision-I & Paediatric Optometry

CO1: Assessment of child vision and refractive error and dispensing of glass for child patients.

CO2: Able to identify the binocular anomalies and their management.

CO3: Able to define child strabismus, management and vision therapy.

Low vision eye care-I

CO1: Definition of low vision, impact and prevalence of low vision and management.

CO2: Clinical assessment of low vision patients and causes.

CO3: Able to prescribe different type of magnifications and low vision devices as per patient's diseases/ complaints.

Sports vision

CO1: Able to identify the cases where special intervention is required.

CO2: Knowledge of preservation and protection of eye vision.

CO3: Skill to be improved for dynamic visual acuity, body co-ordination and visual memory.

Clinics –I

CO1: Able to do comprehensive eye check up and their management.

CO2: Communication skill to be improved.

CO3: Knowledge of binocular abnormalities and visual impairment and management.

SEMESTER 2

Research methodology, Biostatistics and hospital administration

CO1: Basic of research methodology and research frame work.

CO2: Knowledge data collection and data sampling.

CO3: Knowledge about research design.

CO4: Knowledge of hospital administration and hospital management.

Binocular vision-II and vision therapy

CO1: Knowledge of diagnostic evaluation of strabismus, management and prognosis.

CO2: Classification of nystagmus, type and management.

CO3: Knowledge of treatment of amblyopia, suppression and diplopia.

CO4: Under action and over action of extra ocular muscles.

Low vision care-II

CO1: Knowledge about different types of magnification and low vision devices.

CO2: Knowledge about computer assistive technology for low vision patients.

CO3: Knowledge about functional and residual vision to achieve independent living.

CO4: Knowledge about visual rehabilitation.

SEMESTER 3

Contact lens-II

CO1: History and material of contact lenses.

CO2: Examination procedure for contact lens patients.

CO3: Knowledge about care and maintenance of contact lens.

CO4: Knowledge about cosmetic, prosthetic, therapeutic contact lenses.

Ocular disease and diagnostic procedure-II

CO1: Basic concept of Glaucoma, cornea, retina evaluation and management.

CO2: Knowledge of EOG, VEP and Neurophthalmology.

CO3: Knowledge about nerve fibre analysis, OCT and Perimetry.

Contact lens-II

CO1: Knowledge about special contact lens fitting.

CO2: Knowledge about contact lens complication and their management.

CO3: Knowledge about business aspect of contact lens practice.

Dispensing optics-II

CO1: Basic concept of single vision, bifocal, and multifocal glasses.

CO2: Knowledge about Troubleshooting.

CO3: Knowledge about lens and frame materials.

CO4: Knowledge about lens verification.

CO5: Knowledge about business aspect of glasses.

Refractive surgery

CO1: Knowledge about normal dimension of cornea.

CO2: Knowledge about topography report and refractive surgery.

CO3: Knowledge about corneal refractive surgery complication and managements.

Environmental optometry

CO1: Knowledge about types of ocular hazards and their management.

CO2: Knowledge about safety organization in hazards work place.

CO3: Basic concept of assessment of particular work profession.

Programme Specific Outcomes MRIT (Masters of Radio Imaging Technology)

After the completion of the course students will be able to:

PSO 1. Pursue Ph.D.

PSO 2. Work as Application Specialists in MNC's like GE, Philips, Siemens

PSO 3. Work as Lecturer in Institutes or University.

PSO 4. Work as a part of health team in intensive care unit and operational theatre.

PSO 5. Work as Health care professional in corporate world.

Course Outcome of B.Sc Radio-Imaging Technology

SEMESTER- 1

1. Anatomy I:

CO1: Introduction: Definition of Anatomy its subdivisions, Anatomical planes & terminologies.

CO2: Musculoskeletal system: Classify Muscles, Bones & Joints & describe its structure, functional aspect, types of movements, range, blood supply, nerve supply & applied anatomy.

CO3: Describe bony architecture, joints, muscles, major nerves, radiographic identification of bones and joints & applied anatomy of Upper Extremity & Lower Extremity.

CO4: Describe origin, insertion, actions & nerve supply of Back Muscles & Facial Muscles.

CO5: Describe the salient features and parts of cardiovascular system.

CO6: Describe the salient features and parts of Lymphatic system.

CO7: Describe the salient features and parts of Gastro-intestinal system.

CO8: Describe the salient features and parts of Respiratory system.

2. Physiology:

CO1: Describe morphology, Structure and function of cell membrane, transport across cell membrane, Homeostasis.

CO2: Must know the composition & functions of Blood. Formation & functions RBC, WBC, Platelets & Plasma.

CO3: Cardiovascular System: Must know the Conducting system- components, impulse conduction of Heart valves; Cardiac cycle-definition, phases of cardiac cycle, Heart Rate Regulation.

CO5: Digestive System: Must know digestion & absorption of nutrients, gastrointestinal secretions & their regulation.

CO6: Must know about the Functions of Liver & Stomach.

CO7: Nervous system: Describe central and peripheral nervous system, functions of nervous system.

CO8: Nerve Muscle Physiology, Muscles-classification, structure, properties, Excitation, contraction, coupling.

CO9: Nice to know about Concept of nerve injury &Wallerian degeneration Synapses.

3. Basic Physics:

CO1: Must know the General Physics which includes Electrical charges, potential difference, current and resistance, Ohms Law, Electromagnetism.

CO2: must know about the types of matter: conductor semiconductor & insulator.

CO3: Describe the X-ray Circuit.

CO4: Must know about the Transformers its construction & types.

CO5: Must know about rectifier & Rectification and its types.

CO6: Must know about the X-ray generator & its type ((Phases – Single & Triple Phase modes, Three Phase 6-pulse mode, three phase 12- pulse mode

CO7: Must know about beam limiting devices.

CO8: Must know about the Grids AEC, Exposure switches & Timer.

CO9: Must know about the filament circuit and tube current.

4. Image Acquisition, Processing & Archiving:

CO1: Must know about the X-ray film and Image processing: Composition of single and double coated radiographic films.

CO2: Must know about the Characteristic Curve, Silver Recovery Handling & storage of Films.

CO3: Must know about the construction, functions & types of intensifying screens.

CO4: Must know about the construction, functions & types of Cassettes, Loading & Unloading of Cassettes, and care/maintenance of Cassettes.

CO5: Must know about the Image Processing: Must know about Automatic Film Processing & Manual Film Processing.

CO6: Must know about the factors that effect on image quality.

CO7: Must know about the Darkroom: Introduction, purpose and location of dark room, layout of dark room, entrance, pass box, hatch, hangers, safe light, criteria of safe light, safe light test.

CO8: Must know about DICOM, PACS its type and Teleradiology.

CO9: Advantages &disadvantages of Digital Radiography & Computed Radiography.

SEMESTER- 2

1. Anatomy-II

CO1: Urinary System: Must know the parts & salient features of urinary system.

CO2: Reproductive System: Must know the Parts of male and female reproductive system with salient gross features of testis & uterus, ovary and fallopian tube.

CO3: Endocrine System: Describe the List of the endocrine glands, their position and salient gross features.

C04: Nervous System: Classification of the nervous system, Neuron- structure and classification.

CO5: Names of lobes of Cerebrum and cerebellum, Salient features of brainstem, Cerebrospinal fluid and its circulation, names of cranial nerves.

CO6: Embryology: Describe Spermatogenesis & oogenesis, Ovulation & fertilization.

CO7: Sensory Organs: Structure & Functions of Eye, Ear & Skin.

2. Physiology – II:

CO1: Must know the Physiology of of kidney and urine formation (Glomerular filtration rate, Tubular function, Features of ureter, Urinary bladder & Urethra).

CO2: Must know the Digestion & absorption of nutrients, gastrointestinal secretions & their regulation.

CO3: Must know about the Functions of Liver & Stomach.

CO4: Must know the Physiology of Endocrine glands.

CO5: Must to know about Reproductive System: Describe the Functions of male & Female Reproductive organs.

3. Radiation Physics:

CO1: Must know about Exposure switches and Timer / AEC, Beam limiting devices.

CO2: Must know about the x-ray tube stands.

CO3: Must know about the Tube overload indication, X-Ray Tube over Load Protection Circuits.

CO4: Describe X-ray tubes & its types, Care and maintenance of all X-Ray equipment and accessories.

CO5: Must know about Fluoroscopic equipment, Dental & Portable radiographic equipments.

CO6: Must know about the Line Focus principle.

CO7: Must know about the Anode Cooling chart.

CO8: Must know about the X-Ray Tube over Load Protection Circuits.

4. General Radiography-I:

CO1: Must know the Role of Radiographer in Hospital practice and Patient care.

CO2: Must know about the technical factors of x-ray tube.

CO3: Must know the Positioning of X-Ray Chest with different types of views (AP, Lateral, Oblique, Decubitus etc) and there uses.

CO4: Describe the Positioning for radiograph of Upper limb with Central Ray, selection of exposure factors, selection of cassettes according to region of interest.

CO5: Must know about the lower limb with Central Ray, selection of exposure factors, selection of cassettes according to region of interest.

SEMESTER-3

1. General Radiography- II:

CO1: Must know the types of view of skull radiography including AP, Lat, PNS, SMV, Town's view, etc.

CO2: Must know about different projection of abdomen including AP (supine), LAT, Erect, KUB etc with their indication.

CO3: Must know different projection of Spine including AP & LAT of cervical, lumber, dorsal & Pelvis Radiography with Central Ray, selection of exposure factors, selection of cassettes according to region of interest.

CO4: Describe briefly about Skeletal Survey.

2. Mammography & Echocardiography:

CO1: Must know about the Mammographic equipment, Mammographic radiation dose.

CO2: Must know about the dedicated mammographic unit and its special features. Types of mammography.

CO3: Must know about the Routine Mammographic Positioning & Views with additional views and technical considerations, Ex- CC, MLO view.

CO4: Must know about the Wire localization in mammography.

CO5: Must know about the BI-RADS Term.

CO6: Must know about Radiation Safety & Radiation Hazards in mammography

CO7: Must know about Film screen mammography & Digital mammography

CO8: Briefly about Echocardiography equipments.

3. Ultrasound & Doppler including 4D:

CO1: Ultrasound: Describe the Principle, history of Ultrasound & Ultrasound Equipment description.

CO2: Must know about Doppler Principle & its types.

CO3: Must know about various protocols of USG Ex. Abdomen, Neck, and Thorax etc.

CO4: Must know about USG Contrast media & Jelly.

CO5: must know about Ultrasound tissue characterization.

CO6: Nice to know about Comparison of ultrasound equipment Computerization of data, Image recording.

CO7: Must know about Color Doppler imaging & obstetric Ultrasound examination.

4. Radiation Hazards & Protection-I :

CO1: Must know the principle & history of Radiation Protection.

CO2: ALARA/ALARP principal and its benefits, Types of radiation and their disadvantages.

CO3: Must know about the biological effect & types of effects of radiation on human body.

CO4: Must learn to work safely in radiation zone using various Radiation monitoring devices (Area & Personal Monitoring).

CO5: Must know about all radiation hazards, safety of women and children, pregnant women.

CO6: Must know about the safety of patient attendants, radiation workers and hospital staff.

CO7: Must know about the checking of lead aprons, leakage radiation from tube head.

CO8: Must know about the radiation survey in and around X – ray installation.

SEMESTER – 4

1. Hospital practice & Care of Patient:

CO1: Describe briefly Hospital staffing and administration, medical records and documentation.

CO2: Must know about Professional ethics and Code of conduct of radiographer.

CO3: Must know about handling of patients which includes seriously ill and traumatized patients.

CO4: Must know about the visually impaired, hearing and speech impaired patients, mentally impaired patients, infectious patients.

CO5: Describe about Departmental Safety i.e. safety from hazards due to radiation, electricity etc.

CO6: Must know about Infection control, first aid, Anesthesia uses in hospital.

2. Introduction to CT Scan & MRI:

CO1: Must know the basic Principle of CT, History of CT Scan.

CO2: Must know about the Generation of CT scan.

CO3: Describe Image acquisition, Image reconstruction, Image display and documentation of CT scan.

CO4: Must know about the basic Principle of MRI & Instrumentation.

CO5: Must know about the Basic Pulse Sequences of MRI.

CO6: Must know about the types of Contrast used in MRI.

CO7: Must know about imaging techniques related pathology including cross sectional anatomy in CT & MRI.

3. Special Investigations & Pathology:

CO1: Must know about Contrast media, Reactions to contrast & Emergency drugs and its dose.

CO2: Must know about the definition, indication, contra indication, preparation & procedure of all the diagnostic procedure.

CO3: Must know about all the special procedure of excretory system (IVU, RGU, MCU etc).

CO4: Must know about all the special procedure of barium study (barium swallow, barium mean BMFT) etc.

CO6: Must know about about Introduction, pathology of biliary tree, indications, apparatus, procedure and patient (PTC, T-tube colangiography, sialography etc).

CO7: Must know about the indication contraindication and preparation of HSG.

CO8: Must know about the Forensic Radiography, Theatre Radiography, and Macroradiography.

4. Radiation Hazards & Protection-II

CO1: Must know about AERB safety code and ethics.

CO2: Must know about Patient protection-Safe work practice in diagnostic radiology.

CO3: Must know about the Personnel requirements and responsibilities-regulatory controls.

CO4: Must know about the X-ray examinations associated with illness, not associated with illness-medico-legal or insurance purpose x-ray examination-medical research x-ray avoidance of unnecessary radiation dose.

CO5: Desirable to know about Safety and prevention-legal requirements.

CO6: Must know about Radiation absorbed dose from general dental fluoroscopy, X-Ray and CT examinations.

CO7: Must know about Radiation emergencies- situation handling.

SEMESTER-5

1. Magnetic Resonance Imaging- Basic principle and techniques:

CO1: Must know about the History of MRI, Magnetism, Basic Principle, hardware etc.

CO2: Must know about Contrast media Types of Contrast agents used in MRI.

CO3: Must know about Imaging Instrumentation of MRI.

CO4: Must know about Basic pulse sequences (spin & gradient sequences).

CO5: Must know about Bio-effects and safety in MRI.

CO6: Must know about the all routine MRI protocol Ex. Brain, spine, knee, shoulder, abdomen etc.

CO7: Must know about the MRI artifacts.

2. Computed Tomography -Basic principle and techniques:

CO1: Must know about the Basic principle of CT scan history of CT scan.

CO2: Must know about the Generation & Scanning principle of CT scan.

CO3: Must know about the CT instrumentation.

CO4: Must know about routine protocol of CT scan (head, thorax, abdomen etc).

CO5: Must know about the artifacts of CT scan.

C06: Must know about the contrast media and its reaction.

CO7: Desirable to know about the Quality assurance and quality control, its purpose, benefit and record maintaining.

3. Nuclear Medicine & PET scan:

CO1: Must know about the Applications and Apparatus for nuclear medicine.

CO2: Must know about the gamma camera its principle, application & instrumentation.

CO3: Must know about the PET scan, its principle instrumentation & uses.

CO4: Must know about the definition, application & uses of SPECT.

CO5: Desirable to know about the PET CT & PET MRI and its application

CO6: Must know about radionuclide and its half-life.

CO7: Must know about the commonly used radionuclide & its application.

CO8: Must know about the routine protocol for PET scan.

SEMESTER – 6

1. Advances in CT scan:

CO1: Must know about the Spiral CT, Preparation of Patient, Contrast Media, Indications and Contraindications & Technical Aspects of various procedures in CT.

CO2: Must know about the CT fluoroscopy & its uses.

CO3: Must know about the cardiac multislice CT its Triggering Retrospective ECG Gating

CO4: Must know about the Principle of CT guided biopsy, Image Reconstruction Technique & Radiation Safety

CO5: Must know about the CT Urography, Image Reconstruction Technique & Radiation Safety

CO6: Must know about the various CT angiography, Image Reconstruction Technique & Radiation Safety.

CO7: Must know about the CT enterography, Image Reconstruction Technique & Radiation Safety.

CO8: Desirable to know about Virtual CT – Bronchoscopy, Endoscopy.

2. Advances in MRI:

CO1: Must know about MRI Advancements.

CO2:MR Angiography, MR Spectroscopy, DWI, Functional MRI, MRCP etc with their physics and management of the patient.

CO3: Must know about the Principle of MRI urography, Planning and Image Reconstruction Technique.

CO4: Must know about the Principle of MRI guided biopsy Planning and Image Reconstruction Technique.

CO5: Must know about the Principle of MRI angiography, Planning and Image Reconstruction Technique.

CO6: Must know about the Principle of MRI Enterography, Planning and Image Reconstruction Technique.

CO7: Must know about the fast spin echo sequences which include turbo spin echo pulse sequence, Echo Planar Imaging, Single Shot sequences

Course Outcome of M.Sc Radio-Imaging Technology

SEMESTER 1

HUMAN ANATOMY

CO1: Organization of the human body & Anatomical terminologies.

CO2: Describe the morphology, diversity, structure & function of cell organelles

CO3: Describe the macroscopic & microscopic studies of epithelial tissue, Connective tissue, Nervous tissue & cartilaginous tissue.

CO4: Describe the major skeletal muscles of the Head, Neck, Thorax, Abdomen & upper and lower limbs.

CO5: Must know the structural classification, morphology, development and growth of bones.

CO6: Must know the Anatomy of the adult & foetal heart, major arteries and veins, cellular components of blood.

C07: Must know the Anatomy of the lymphatic vascular structures, Lymph nodes,

Tonsils, Spleen and thymus.

C08: Describe the contents of the peripheral nervous system & autonomic nervous system.

C09: Must know the Anatomy of the Respiratory System including the thoraco-abdominal diaphragm, epithelium of the respiratory tract and the lungs

C10: Must know the Anatomy of the Digestive System i.e. Mouth, Salivary glands, Pharynx, esophagus, stomach, intestine, liver pancreas, biliary system & peritoneal cavity, esophagus, stomach, small intestine, pancreas & liver.

C11: Must know the Anatomy of the kidneys, Ureters, Urinary bladder and the urethra.

C12: Must know the anatomy of Endocrine glands including

C13: Must know the anatomy of male & female Reproductive System including testis, Epididymis, Prostate gland, Uterus, Uterine tubes & Functions of Estrogen, Progesterone & Testosterone.

C14: Detailed plain radiographic anatomy of upper limb & lower limb.

C15: Must know the Radiographic anatomy of different parts in various projections, Surface anatomy and applied anatomy pertaining to Radiology.

HUMAN PHYSIOLOGY

CO1: Describe function of cell membrane, transport across cell membrane & Muscle properties including excitation/contraction coupling.

C02: Must know the Classification & properties of CNS & PNS; Physiology of Touch, Pain, Temperature & Perception; Physiology of Muscle Tone & Stretch.

C03: Must know about Kidneys structure & function, neurogenic bladder, Temperature Regulation, Circulation of the skin- body fluid-electrolyte balance.

C04: Describe the Mechanics of respiration, Anatomical &Physiological Dead space-ventilation/perfusion ratio.

C05: Describe Structure & properties of cardiac muscle, Cardiac cycle, Heart rate regulation, factors affecting Heart Rate, Regulation & factors affecting BP, Cardiac output- Regulation & function affecting Cardiac output.

C06: Describe the Physiology of Digestive System including Mouth, Salivary glands, Pharynx, esophagus, stomach, intestine, liver, pancreas & biliary system.

C07: Must know the Physiology of Endocrine glands.

C08: Must know the Physiology of male & female Reproductive organs

C09: Must know the Physiology of Special Senses: Eye, Ear & skin.

C10: Physiology of the lymphatic vascular structures including tonsils, Spleen and thymus.

PATHOLOGY & TERMINOLOGY

C01: Must know about Introductory Pathology which includes Cellular adaptation and cell death, Inflammation and repair, infection, circulatory disorders, immune defense, Cell injury and adaptation, Types of inflammation &system, manifestations of inflammation, Disorders of vascular flow & shock, Bleeding disorders, coagulation mechanism.

C02: Describe the causes of Disease & Inflammatory response to infectious agents.

C03: Pathology & Terminologies of Gastrointestinal System

C04: Pathology & Terminologies of Respiratory System

C05: Pathology & Terminologies of Circulatory System

C06: Pathology & Terminologies of Renal System

C07: Pathology & Terminologies of Nervous System

C08: Pathology & Terminologies of Reproductive System

IMAGE PRODUCTION & EVALUTION

CO1: Must know about the X-ray film and Image processing, Manual as well as automatic processing.

CO2: Must know about the intensifying screens, Sensitometer & Film/screen combinations/analyzing the image.

C03: Must know about Radiographic Quality- Density: contrast, Recorded detail, distortion, the art of films critique- Implementing imaging standers, & Identifying an image problem.

C04: Describe about Exposure System i.e. Comparing exposure systems, Developing exposure charts, fixed kilovoltage system & Variable kilovoltage system, Automatic exposure controls, Advantages and disadvantage associated with automatic exposure control.

C05: Must know about Darkroom installation& Image processing i.e. Planning of a processing room, Day light processing system, Laser camera, Dry camera, Xero-radiography & Conventional Subtraction technique

C06: Must know the Relationship among density, distortion, contrast, and recorded detail.

C07: Must know the Relationship between films and screens.

C08: Explain the Simulated radiographic procedure, Use, Technique, Charts to select exposure factors, Film storage Considerations.

C09: Must know about the Periodic maintenance for automatic film processors

C10: Must know about the Loading & Unloading of films in Cassettes.

RADIATION PHYSICS

CO1: Must know about the General Physics including Electrical charges, potential difference, current and resistance, Ohms Law for electrical circuit, capacitance, Electromagnetic Induction, Electromagnetism.

CO2: Must know about the X-ray interaction with matter

CO3: Must know about the Characteristic radiation, Bremsstrahlung Radiation.

CO4: Must know about the Ionizing Radiation and its quantities and units, Thermionic emission and properties of X-Rays.

CO5: Must know about X-ray Tube Stand and Control panel, Rectification: Three Phase 6-pulse mode & three phase 12- pulse mode, Specialized X-Ray Generators.

CO6: Explain X-ray Circuits: Rectification, types & Laws of Transformer, control of kilovoltage, Filament circuit and tube current.

CO7: Explain Exposure switches and relays timers and its radiographic application, Beam limiting devices, Absorption co-efficient, grids, cones and filter, Electronic Timers; Automatic Exposure Control Timers, Phototimer.

CO8: Must know about different types of X-ray tubes: Grid Controlled X-Ray Tube, Micro-Focus X-Ray Tube, Heavy Duty X-Ray Tube & Mammography X-Ray Tube.

CO9: Must know about Tube Rating and Tube Support, Line Focus principle, Anode Cooling chart, X-Ray Tube overload Protection Circuits.

CO10: Explain Grids, Types of Grid & Grid Cutoff.

C011: Describe Fluoroscopic Equipment, Digital Fluoroscopic, Portable and Non- Portable equipments

RADIATION HAZARDS, PREVENTION & SAFETY

C01: Explain Radiation Protection Principles, History & development of National & international agencies: AERB, BARC, ICRP, WHO,IAEA and their role

C02: Must know about Equivalent dose, effective dose, absorbed dose, attenuation, Sources of radiation-natural& man made.

C03: Must know about biological effects of Radiation: Cellular radiobiology, acute radiation syndrome, Hereditary effect, effect in Single strand & double strand DNA break and cross linking effects, Effects on cell, stochastic & deterministic effects.

C04: Describe the Protection from primary, leakage/scattered radiation Explain Workload, Use factor, Occupancy factor & distance.

C05: Explain Primary & secondary barrier design calculations, Design of doors, Control of radiation-Effects of time, Distance and shielding.

C06: Must know about Personal monitoring Devices: TLD, Film badge etc.

C07: Must know about Area monitoring Devices: survey meter, Zone monitors and phantoms.

C08: Must know about AERB safety code and ethics.

C09: Must know about Specification for radiation protection devices-room layout Operational safety, Radiation protection programme: Personnel requirements and responsibilities, regulatory controls, Human Dose limits as per permissible guidelines.

C10: Must know about Safe work practice in diagnostic radiology & Radiation Emergencies i.e. situation preparedness, safety and prevention during emergencies.

SEMESTER 2

EQUIPMENT OPERATION AND QUALITY CONTROL

CO1: Must know about the Various Radiographic equipment and accessories which includes equipment's used for Sonography, Computed radiography, CT,MRI & digital radiography.

CO2: Must know about the Differences in various types and models of portable radiographic equipment.

CO3: Must know about the X-Ray Tube which includes Theory of operation of an X-ray tube, Construction and function of an X-ray tube determine the rate of anode and tube housing cooling, X-ray tube warm-up procedures for radiographic equipment from various manufactures.

CO4: Must know about the image quality which includes Image contrast, ABC (automatic brightness control), Noise, sharpness, magnification, spatial and temporal resolution.

CO5: Must know about the Safety checks of radiographic equipment which includes Safety checks of radiographic equipment and accessories such as lead aprons and gloves and collimator accuracy.

CO6: Must know about the Identify symptoms of malfunctions in radiographic equipment.

CO7: Must know about the Quality control and quality assurance which includes Quality assurance and quality control of X-Ray, CT, MRI, USG, DEXA, DR, CR, Fluoroscopy, Mammography, DSA, Portable equipment etc.

RADIATION PROTECTION & ADVANCED DIAGNOSTIC TECHNIQUE

CO1: Must know about the Beam Restricting Devices which includes use and function of beam limiting devices, Beam filtration and shielding devices.

CO2: Must know about the ALARA, Nature and function of the ten-day rule.

CO3: Must know about the Radiographic Procedures which includes Methods to avoid repeat radiographs.

CO4: Must know about Radio diagnosis & radiographic equipment's and techniques used to reduce personnel exposure during radiographic.

CO5: Must know about the Radiographic Devices which includes Types and purposes of personnel protective devices used during radiographic, fluoroscopic, mobile, and surgical procedures.

CO6: Must know about how to reduce radiation dose to the personal as well as public.

CO7: Must know about the Personnel monitoring devices in terms of purposes, types, characteristics, advantages and disadvantage.

CO8: Must know about how to improve image quality and how to reduce artefacts.

CO9: Must know about the Digital Radiographic Imaging which includes Radiation protection in Digital Radiography, Radiotherapy and Bracheotherapy.

RADIO DIAGNOSIS & RADIOGRAPHIC PROCEDURES

CO1: Must know about the Positioning Terminology which includes Types and functions of immobilization and positioning devices.

CO2: Must know about the Radiographic procedure, appropriate breathing instruction for patientpositioning and technique variations for various radiographic procedures.

CO3: Must know about the Routine Radiography Procedure which includes Upper limb: Technique for hand, fingers, thumb, wrist joint carpal bones, forearm, elbow joint, radio ulnar joints etc.

CO4: Must know about the radiography and technique of lower limb which include foot, toes, great toe, tarsal bones, calcaneus, ankle joint, leg, knee, patella & femur etc.

CO5: Must know about the radiography & technique of Pelvic girdle and hip region.

CO6: Must know about the radiography of skull Basic projections for cranium, facial bones, nasal bones and mandible etc.

CO7: Must know about the Dental Radiography: Technique for intra oral full mouth, Occlusal projections, Extra oral projections including ortho- pantomography, Supplementary techniques.

CO8: Must know about the Upper respiratory tract: Technique for post nasal airways, larynx, trachea, thoracic inlet, Valsalva manoeuvre, Phonation.

CO9: Must know about the Macro radiography: Principle, advantage, technique and applications.

CO10: Must know about the Stereography: Procedure, presentation, for viewing, stereoscopes.

CO11: Must know about the High KV techniques & Low kVp Technique, Principle and its applications.

CO12: Desirable to know about Trauma radiography/Emergency radiography, Neonatal and Pediatric Radiography, Tomography and Tomosynthesis, Dual energy X-ray absorptiometry, Forensic Radiography, Community Radiography.

Nuclear Medicine & PET Training

CO1: Must know about the Nuclear Physics &Nuclear Medicine which includes Electromagnetic spectrum. Radioactivity & Interaction of Radiation, Applications and apparatus for nuclear medicine.

CO2: Must know about the construction, principle and application and types of Gamma camera.

CO3: Must know about the Definition, Applications, Clinical uses, advantages & disadvantages of SPECT.

CO4: Must know about the PET CT & PET MRI.

CO5: Must know about the Radionuclides & radioactivity.

CO6: Must know about the Routine protocols, Indication, contraindications of PET Scans.

SEMESTER 3

MAMMOGRAPHY, ULTRASOUND &ECHOCARDIOGRAPHY

CO1: Must know about the dedicated mammographic unit and its special features, X-ray tube design, compression, scattered radiation, magnification.

CO2: Must know about the Mammographic Positioning and technical considerations.

CO3: Must know about the Film screen mammography, digital mammography and BIRADS.

CO4: Must know about the Principle & history of Ultrasound, advantages and disadvantages of ultrasound, Types of Ultrasound.

CO5: Must know about the equipment description of USG.

CO6: Must know about the Indication and Clinical Application, Physics of transducers.

CO7: Must know about the Ultrasound tissue characterization, Potential for three dimensional ultrasound, and 4D.

CO8: Must know about the Physics of ultrasound imaging, Physics of Doppler.

CO9: Must know about the artefacts in USG.

CO10: Must know about the Positioning and scanning technique of various protocols (Abdomen and pelvis ultrasound, Neck, Orbit, Submandibular gland, Thorax, Breast, Scrotum Pathologies and indications & patient preparation.

CO10: Must know about the colour Doppler imaging which includes method of gynaecologic ultrasound examination, Assessment of Normal fetal growth, fetal behavior states, fetal breathing movements, fetal cardiac activity.

CO11: Must know about the USG contrast media & types of Ultrasound Contrast media and its advantages.

CO12: Must know about the echocardiography, uses of ECG and image formation.

CO13: Must know about the Uses of colour Doppler in echocardiography and equipment description with transducer.

SPECIAL INVESTIGATION & TECHNOLOGY

CO1: Must know about the contrast media, History of contrast media, types of contrast media (Positive and negative).

CO2: Must know about the adverse effect of contrast media and contrast reactions.

CO3: Must know about the Soft tissue radiography, High KV techniques, Macro-Radiography, Micro-radiography, Foreign body localization.

CO4: Must know about the Anatomy, Clinical Indication and contraindication, Patient preparation, contrast media and does, injection procedure, techniques for radiographic projections, after care and pathology conditions.

CO5: Must know about the Special procedures: IVP/IVU, RGU, MCU, Anatomy, Clinical Indication and contraindication, Patient preparation, contrast media and does, injection procedure, techniques for radiographic projections, after care and pathology conditions.

CO6: Must know about the Gastrointestinal Tract Imaging which include Barium Study- Barium Swallow, Barium Meal, BMFT, Barium Enema, Double contrast, Hypotonic Dudenography, Defaecography and distal colography - Anatomy, Clinical Indication and contraindication, Patient preparation, contrast media and does, injection procedure, techniques for radiographic projections, after care and pathology conditions.

CO7: Must know about the Biliary System which includes PTC, T-Tube cholangiography, ERCP, Pre-Operative cholangiography, Oral Cholecystography/Intravenous Cholangiography-Anatomy, Clinical Indication and contraindication, Patient preparation, contrast media and does, injection procedure, techniques for radiographic projections, after care and pathology conditions.

CO8: Must know about the Sialography & Dacrocystography which includes Anatomy, Clinical Indication and contraindication, Patient preparation, contrast media and does, injection procedure, techniques for radiographic projections, after care and pathology conditions.

CO9: Must know about the Reproductive Glands which include HSG- Anatomy, Clinical Indication and contraindication, Patient preparation, contrast media and does, injection procedure, techniques for radiographic projections, after care and pathology conditions.

CO10: Must know about the Interventional Procedure which include Paediatric radiography, Discography, Myelography, Herniogram, loopogram, invertogram, Scanogram, Fistulogram, sinogram, Arthrography, Pelvmetery (Anatomy, Clinical Indication and contraindication, Patient

preparation, contrast media and does, injection procedure, techniques for radiographic projections, after care and pathology conditions).

CO11: Must know about the PTC, ERCP, PCN and FNAC: Fluoroscopy/ US/CT guided.

CO12: Must know about the DSA, Application, advantage, disadvantages, benefits etc.

CO13: Must know about the catheter its types, & stents, ballooning technique in Angiographic procedures.

CO14: Must know about the CT and MRI-Various imaging protocols and techniques Digital imaging, applications and advancements.

RECENT ADVANCEMENTS IN MODERN IMAGINGTECHNOLOGY

CO1: Must know about the History & Principal of Interventional Radiology.

CO2: Must know about the patient preparation, High risks patients, advantages and disadvantages of interventional radiology.

CO3: Must know about the Basic Angiography and DSA which include History , technique, patient care, Percutaneous catherisation, catheterization sites, Asepsis, Guide wire, catheters, pressure injectors, accessories, Use of digital subtraction- single plane and bi-plane.

CO4: Must know about the all forms of diagnostic procedures including angiography, angioplasty, renal evaluation and drainage procedure and aspiration cytology under flouoro,CT,US,MRI guidance Angiography

CO5: Must know about the Venography: Peripheral venography, Cerebral venography, Inferior and superior venocavography.

CO6: Must know about the Cardiac catheterization procedures: PTCA, BMV, CAG, Pacemaker, RFA, Nerve Block, etc.

CO7: Must know about the Real time CT Fluoroscopy Interventional guidance tool 3D.

CO8: Must know about the CR/DR and DEXA.

CO9: Must know about the PACS which include history, definition, introduction, display system, Computer Network, Storage System, and Tele-radiology.

PATIENT CARE & EVALUATION

CO1: Must know about the patient care which include Principles of body mechanics applicable to patient care & Procedures for patient transfer.

CO2: Must know about the Contrast reaction in radiology department, Emergency Drugs, ABCD principal.

CO3: Must know about the Infection Control which include Disinfection and sterilization procedures & Procedures for scrubbing, Donning gowns and gloves, Removing gowns and gloves, and handling sterile instruments.

CO4: Must know about the Procedures for handling and disposing of infectious wastes, &Isolation techniques.

CO5: Must know about the Management of infectious patients which include Psychological considerations for the management of infectious patients- Communicable disease, Patient Hygiene, Personal Hygiene and department Hygiene.

CO6: Must know about the Vital signs used to assess patient condition, measurements of Vital signs- Clinical measurement and recording of temperature, pulse, blood pressure and respiration.

CO7: Must know about the Emergency Patients Handling which includes Symptoms of cardiac arrest, anaphylactic shock, convulsion, seizure, haemorrhage, apnea, emesis, aspiration, fractures and diabetic coma/insulin reaction.

CO8: Nice to know about the Acute care procedures for cardiac arrest, Anaphylactic shock, Convulsion, Seizure.

CO9: Must know about the Use of medical equipment and supplies in treating medical emergencies.

CO10: Must know about the Medico-Legal Considerations which include Communication Skills of radiographer, Informed Consent form, Clinical/General and Ethical responsibilities, Misconduct and malpractice, handling female patients

SEMESTER 4

COMPUTERIZED TOMOGRAPHY

CO1: Must know about the principle of CT & generation of CT scan.

CO2: Must know about the CT Angiography, Virtual reality imaging including image quality.

CO3: Must know about the Computer Tomography & Various imaging protocols and techniques, Post processing and making CT Films with MIP, MPR, VR, 3D techniques etc.

CO4: Must know about the Advancement in CT scan which includes recent developments in x-ray tube technology.

CO5: Measure to control scatter radiation including-Beam centering devices, Pre and Post collimator, CTDI and DLP calculation.

CO6: Must know about the Conventional Tomography principles, various types and its applications.

CO7: Must know about the Special procedures of CT which include CT Angiography Procedure-Brain, Neck, Brain + Neck, Pulmonary, Cardiac angio with respiratory gating, Liver Triple phase, Renal angio, Upper Limb and Lower Limb Angiography, Enterography, Myelography etc.

CO8: Must know about the CT Interventional Procedures which includes CT Guided FNAC, Biopsy, and Tapping.

CO9: Must know about the all types of CT Artefacts and its corrective measures.

MAGNETIC RESONANCE IMAGING

CO1: Must know about the MRI Basic & Hardware which include History of MRI, Basic principles of MRI Complete imaging equipment and various requirements, & Types of Magnets and Use in MRI.

CO2: Must know about the Instrumentation of MRI.

CO3: Must know about the MRI Physics which includesT1 and T2 Relaxation, Behaviours of tissues T1T2 and proton density images, Spiral localization of images, K-Space and its filling, Image reconstruction in MRI.

CO4: Must know about the MRI Sequences& Parameters which includes Types of imaging sequences (Spin echo, fast spin echo, flash, Inversion recovery, gradient echo etc.).

CO5: Must know about the MRI Coils which includes Transmitted coils, receiver coils, transmit and receive coils, gradient coils.

CO6: Must know about the all types of artefacts in MRI and its corrective measures.

CO7: Must know about the MRI Special Procedures & Sequences which includes MR Angiography sequences TOF- 2D and 3D,

Phase contrast, MRI Venography, MRI Urography, MRCP, MRI guided Procedures MR spectroscopy, principles and techniques, DWI, Diffusion Tensor Functional MRI and BOLD sequences.

CO8: Must know about the MRI Hazard and Safety which includes Planning of MRI Equipment installing in department, MRI Hazard and Safety, Indication and contraindications of MRI.

CO9: Must know about the MRI Contrast Media which includes Types of MRI contrast media- Positive and negative, its dose and indication and contraindications of MRI contrast.

Course Outcome of B.Sc Medical Laboratory Technology

SEMESTER 1

ANATOMY:

CO1: Define anatomy and its subdivisions.

CO2: Describe cell and its organelles and various types of tissues.

CO3: Enumerate anatomy of human body, function of organ and organ system and diseases related to them.

CO4: Identify and classify bones and joints and common movements of joints with range of motion.

CO5: Identify bones of axial & appendicular skeleton with important bony landmarks.

CO6: Identify and explain in brief parts of respiratory system with salient features of lungs.

CO7: Describe quadrants of abdomen and identification of abdominal and pelvic organs.

CO8: Describe Surface Anatomy of main structures and vessels.

PHYSIOLOGY:

CO1: Describe cell structure, function and tissue formation and repair.

CO2: Enumerate Blood formation, grouping and coagulation mechanism.

CO3: Explain Structure and function of organs and organ system in normal human body.

CO4: Define Muscle movements,Muscle tone, Physiology of contraction and Maintenance of posture.

CO5: Demonstrate White Blood Cellcount, Red Blood Cellcount.

CO6: Determine different BloodGroups.

CO7: Enumerate Functions of Neuroglia & Neurons.

CO8: Explain Functions of brain, Spinal cord, cranial and spinal nerves

CO9: Assess Functions of respiratory organs, Pulmonary ventilation, lung Volumes & capacities and Mechanism of respiration.

BIOCHEMISTRY:

CO1: Demonstrate methods of specimen collection and Use of preservatives in specimen collection.

CO2: Explain Preanalytical and analytical variables.

CO3: Enumerate Basic concepts of apparatus, units, equipments and volumetric analysis in the clinical biochemistry.

CO4: Describe Use care and maintenance of Waterbath, Oven and Incubators.
CO5: Demonstrate general tests of biomolecules, carbohydrates and proteins.
CO6: Demonstate Normal urine and abnormal constituents of urine.

MICROBIOLOGY:

CO1: Describe uses of different instruments and microscope used in microbiology lab.

CO2: Demonstrate different staining methods and identify the organisms based on staining.

CO3: Explain Physical and chemical Methods of Sterilization.
CO4: Interpret different Culture Media & Transport Media.
CO5: Demonstrate Sample collection and transport Methods.
CO6: Enumerate Aerobic and anaerobic Bacterial Culture Techniques.
CO7: Describe Principle and techniques of biochemical Test.
CO8: Explain Antimicrobial susceptibility testing by different methods.

PATHOLOGY:

CO1: Describe the concept Normal cell and its functions
CO2: Enumerate Various types of microscope.

CO3: Explain composition and functions of blood.
CO4: Demonstrate Collection & preservation of blood for various hematological investigations.
CO5: Describe Various anticoagulants, their uses, mode of action and their merits & demerits.
CO6: Demonstrate Various methods of estimation of Hb involved and standardization of instrument.
CO7: Explain Quality assurance in hematology.
CO8: Assess Morphology of normal blood cells and their identification.
CO9: Describe ESR & Factors influencing ESR and various procedures for its estimation.

COMMUNICATION SKILL AND PERSONALITY DEVELOPMENT

CO1: Define basic concept of communication, its need in current scenario & how communication is important for a doctor or a medical person..
CO2: Interpret Word formation strategies.
CO3: Enumerate Vocabulary building: Antonyms, Synonyms, Affixation, Suffixation, One word substitution.
CO4: Describe Letter Writing, Paragraph writing and Comprehension.
CO5: Demonstrate Project Writing: Features, Structure.
CO6: Interpret Parts of speech & their uses for correct writing.

CO7: Know basic knowledge of medical terminology.

CO8: Understand presentation skills & art of best presentation to present during conference (National & International).

SEMESTER 2

ANATOMY

CO1: Describe Parts of urinary system,Salient gross features of kidney, urinary bladder, ureter and urethra.

CO2: Enumerate Classification of the nervous system, Names of lobes of Cerebrum and cerebellum, parts of brainstem (salient features only) .

CO3: Explain Cerebrospinal fluid and its circulation, names of cranial nerves, spinal nerve, meninges, ventricles (salient features only)

CO4: Identify bones of the body region-wise – Upper limb, Lower Limb, Head and neck, Thorax, and Abdomen.

CO5: Explain and Identify organs and parts of male and female reproductive system.

CO6: Explain Spermatogenesis & oogenesis, Ovulation, fertilization, Placenta, Fetal circulation.

PHYSIOLOGY

CO1: Describe Functions of skin, eye, ear, nose, tongue and Alterations in disease.

CO2: Enumerate Functions of pituitary, Pineal gland, Thymus, Thyroid, Parathyroid, Pancreas and alteration in diseases.

CO3: Explain Immunity, Formations of T- Cells and B- Cells, Types of Immune response, Antigens, Cytokines and Antibodies.

CO4: Demonstrate White Blood Cell count and Red Blood Cell count.

CO5: Determine Clotting Time and Bleeding Time.

BIOCHEMISTRY

CO1: Describe Maintenance, Care and cleaning of laboratory glassware.

CO2: Demonstrate Use care and maintenance of Water Distillation Plant and Deionizers, Refrigerators, Centrifuges, Laboratory Balance and Direct Readout Electrical Balances,Colorimeter, Spectrophotometer and pH Meter and its Calibration.

CO3:Explain CONVENTIONAL AND SI UNITS USED IN THE LABORATORY.

CO4: Describe and demonstrate Proper method of dilution of a solution or a laboratory sample and Serial dilutions of samples.

CO5: Describe Basic concept of acids, bases salts and indicators.

MICROBIOLOGY:

CO1: Explain basic concept about Antigen & Antibody and precipitation and agglutination reactions.

CO2: Describe Morphology, Classification & infection caused by Microorganisms.
CO3: Enumerate Morphology, culture characteristic, identification, diseases caused and laboratory diagnosis of important pathogenic bacteria like Staphylococcus, Streptococcus, E.coli and Enterobacteriacae.
CO4: Describe and demonstrate Sterilization & Disinfection methods.
CO5: Describe and demonstrate Collection of various clinical specimen .
CO6: Demonstrate difference between Innate immunity And Acquired immunity (adaptive immunity) Active and passive immunity.

CO7: Describe and demonstrate Complement fixation, Neutralization, ELISA, RIA, IF.

CLINICAL PATHOLOGY:
CO1: Describe Physical and chemical properties of body fluid sample such as CSF, pleural fluid & Ascitic fluid and their normal values.
CO2: Demonstrate type of blood group system and their significance.
CO3: Demonstrate various histo-techniques – grossing, tissue processing, fixation, staining with routine & special staining.

CO4: Perform Biomedical waste management.

FUNDAMENTALS OF COMPUTER SCIENCE:

CO1: Describe What are computers, Application areas, Characteristics & limitations

CO2: Interpret data representation in computer memory (numbering systems).

CO3: Explain Basic concept of Word Processing Software.

CO4: Define and interpret Input & output devices, External Interfaces (Ports) & Concept of Device Drivers, Memory Devices.

CO5: Enumerate Secondary Storage Devices: (Magnetic Disk, Floppy and Hard Disk, USBs, Optical Disks CD-ROMs) and to study the MS PowerPoint.

CO6: Describe Functions and Classification of Operating Systems.

SEMESTER 3

BIOCHEMISTRY

CO1: Explain the structure and functions of cell.

CO2: Define Classification and mechanism of action of enzymes and Clinical importance of enzymes and iso-enzymes

CO3: Describe biochemistry of – Carbohydrates, Lipids, Proteins, Nucleic Acids.

MICROBIOLOGY:

CO1:Describe general morphology, classification, charecteristics of fungi and their cultivation methods.

CO2: Demonstrate staining and culture techniques used in mycology.

CO3: Describe and perform laboratory diagnosis of fungal infections which includes superficial mycosis, subcutaneous mycosis and opportunistic mycosis.

CO4: Enumerate general charecteristics and classification of protozoa and helminthes.

CO5: Explain structure, life cycle and laboratory diagnosis of Entamoeba, Trichomonas and Giardia, Plasmodium, Leishmania, toxoplasma, coccidian parasites and helminthes.

PATHOLOGY:

CO1: Describe and demonstrate the Structure and principle of Light microscope, Dark field, Phase contrast microscopy, Fluorescent, Polarizing microscope, & Electron microscopy.

CO2: Explain and demonstrate methods & principle of H&E staining, trichrome staining, PAS.

CO3: Enumerate and interpret metal impregnation techniques and Immunohistochemistry.

CO4: Explain and Demonstrate method & principles of MGG, Papanicoclaos's and H&E, PAS, Mucicarmine, Aician blue.

CO5: Able to perform cytological screening programs and quality control in cytology laboratory.

CO6: Explain haematopoiesis& stem cell , types of anaemia, their causes, clinical features & their pathological findings.

CO7: Describe and demonstrate bone marrow staining & preparation of histological section.

ENVIRONMENTAL SCIENCE:

CO1: Understand the true nature of Environment.
CO2: Describe chemistry of pollution, its abatement and treatment technologies.
CO3: Understand the social impact on environment and vice-versa.

SEMESTER 4

BIOCHEMISTRY:

CO1: Describe and perform Kidney function tests,Liver function tests,Thyroid function tests and Pancreatic function tests.
CO2: Explain and demonstrate Specimen collection and processing, Analytical variables.
CO3: Describe and interpret Glucose tolerance test, Electrophoresis and Chromatography.
CO4: Perform Quality control and Preparing of reports.

MICROBIOLOGY:
CO1: Describe and demonstrate General properties of Viruses method of Collection, transportation and storage of samples for viral diagnosis. Cultivation of viruses.

CO2: Explain life cycle of Bacteriophages (lysogenic and lytic) .

CO3: Perform microbiological processing of the given clinical samples **like** Blood, Sputum, throat swab, nasopharyngeal swab, Swabs (pus, wound), CSF and other body fluids, Stool and rectal swabs.

CO4: Decribe pathogenesis, laboratory diagnosis of diseases caused by Influenza Viruses Rubella, Mumps , Measles, Rota virus, Japanese encephalitis,Dengue and Chikungunya.

CO5: Understand Health care associated infection like blood borne infections (HIV, Hepatitis); respiratory infections like tuberculosis.

CO6: Describe pathogenesis, lab diagnosis and prevention of Emerging infectious diseases like H1N1 and SARS.

CO7: Explain quality control and quality assurance audits.

CO8: Implement Hospital infection control methods.

PATHOLOGY:

CO1: Demonstrate & know about mechanism of inflammation, type of inflammation, causes of inflammation, various cells of inflammation.

CO2: Describe and demonstrate – Mechanism of immunity types of antigens & various types of antibodies, types of hypersensitivity reactions & their manifestations.

CO3: Explain and Demonstrate the classification, difference between benign & malignant tumors, various modes of metastasis & diagnostic features of tumors.

CO4: Enumerate causative agents of malaria, tuberculosis, dengue & AIDS, their pathogenesis and their clinical manifestations.

CO5: Describe use & significance of fat & water soluble vitamins, pathogenesis & clinical manifestations of Rickets & Scurvy.

CO6: Understand and demonstrate Compatibility & incompatibility of tests in blood transfusion, complications of blood transfusion and laboratory investigation of transfusion reactions, & mismatched transfusion.

CO7: Demonstrate preparations of various blood components and their uses.

SEMESTER 5

BIOCHEMISTRY

CO 1- Explain Basic concept of metabolism or protein carbohydrates hemoglobin along with their applied aspects in diagnostic era.

CO 2- Describe and demonstrate about basic Concepts of Hormones, classification , mode of action and their assessment in diagnosis of various endocrine disorders.

CO 3- Explain and interpret Bio safety and rules of waste management in order to reduce hospital acquired infections.

MICROBIOLOGY

CO1- Can understand microbial pathogenicity along with various types of immunit ,structure function and components of immune system, with associated reactions.

CO 2- Describe Types of antigen antibody reactions with their applications in various diseases caused by bacteria, parasites, viruses and fungi.

CO 3- Explain the aspects of transplantation and immunity along with applications in

diagnostic laboratory.

CO4: Describe uses of monoclonal antibodies as research tool, in diagnostic and therapies.

PATHOLOGY

CO 1- Describe various applied histological aspects with various microscopic principles and their applications based on various staining procedures.

CO 2- Enumerate various cytological aspects with special staining procedures associated with and laboratory diagnosis or handling with the specimens.

CO 3- Explain ideas related to cytogenetics , terminology, classification & nomenclature.

RESEARCH METHODOLOGY & BIO STATISTICS

CO 1- Understand and demonstrate definition, characteristics of statistics, Importance of the study of statistics , branches of statistics along with various types of studies , data collection and analysis.

CO 2- Explain concepts regarding measures of central tendency and tabulation of data

CO 3- Define Measure of variability with various properties and uses of variance and Standard deviation.

CO 4-Explain Various Sampling techniques, Uses, applications and practical approach.

SEMESTER 6

BIOCHEMISTRY

CO 1- Enumerate concepts of metabolism along with various disorders associated with them.

CO 2- Explainclinical significance of various enzymes with their diagnostic applications.

CO 3- Describe Various immunoassays and based assays used in diagnosis

CO 4- Describe and interpret analysis of reports along with release through an appropriate channel.

MICROBIOLOGY

CO 1- Explain Classification, Morphology, Genotypic & Phenotypic characteristics, Pathogenesis, Disease caused, Lab Diagnosis & Prophylaxis of Rare pathogens along with applied aspects.

CO 2- Describe bacteriology of various environmental samples along with their significant values.

CO3- Explain various molecular aspects and application in routine laboratory

CO 4-Describe and demonstrate the occupationally acquired infections in health care settings.

CO 5- Explain Various Biosafety levels and biosafety cabinets along with universal precautions.

CO 6- Describe significance of vaccination for health care personnel

PATHOLOGY

CO 1- Define aspects of Immunopathology along with graft and host reactions .

CO 2- Explain Introduction to_Haematology with various diseases associated with it along with Electrophoretic techniques, principles and application in hematology

CO 3- Define and demonstrate about transfusion medicine & blood banking with all the aspects of blood transfusion and donor selection.

CO 4- Enumerate various laboratory investigations in various diseases.

Course Outcome of M.Sc Medical Laboratory Technology

SEMESTER 1

PHYSICAL AND ANALYTICAL BIOCHEMISTRY

CO1: Describe and demonstrate about various equipments and instruments with their uses.

CO2: Explain Role of automation in diagnostic biochemistry

CO3: Enumerate Various types of analysers and their operation in routine testing

CO4: Explain and interpret Organisation and quality control in the laboratory

CO5: Demonstrate Preparation of various reagents and buffer solutions

CO6: Use and operation of Colorimeter, Spectrophotometer, Photometer, HPLC, Thin layer chromatography

CELLULAR PATHOLOGY

CO1: Explain and demonstrate about cells its organelles along with cellular adaptations

CO2: Describe classification of various types of cancers their mode of actions, their molecular basis along with profiling and laboratory diagnosis.

CO3: Enumerate Various genetic disorders due to various types of mutations like Mendelian disorders, sex chromosomes related disorders, diseases caused by change in structural proteins- Marfan syndrome, Ehler's syndrome, Danlos syndrome. Diseases caused by mutations in receptors proteins: Familial hypercholesterolemia, diabetes etc

CO4: Describe and asscess Newer techniques in diagnostic pathology : FISH (Fluorescent in-situ hybridization)

CO5: Enumerate Haematopoiesis along with various haemolytic disorders

CO6: Describe Can analyze urine and blood for the normal and abnormal contents

CO7: Explain various estimations by manually as well as automatically

GENERAL MICROBIOLOGY AND BACTERIOLOGY

CO1: Define History and Pioneers in Microbiology: Contributions of Antony Van Leeuwenhoek, Louis Pasteur, Joseph Lister, Robert Koch (Koch's Postulates)

CO2: Explain Bacterial taxonomy ,classification, structures, pathogenesis along with their activity against antimicrobial agents and their staining methods

CO3: Understand and interpret various types of microscopy and their applications in diagnostic microbiology

CO4: Describe and demonstrate Culture media along with their preparations quality control in the laboratory

CO5: Sterilization and disinfection with their active role in hospital infection control programme and reduction in Nosocomial infection

CO6: Can describe various class of antibiotics mode of action and their resistance pattern

CO7: Enumerate Morphology, Cultural Characteristics, Pathogenesis (in brief), Laboratory Diagnosis of various medically important bacteria causing UTI, Nosocomial infections, pyrexia of unknown origin, Meningitis, Sepsis, Septicemia, Diarrhoeal diseases & food poisoning.

CO8: Can understand immunoprophylaxis along with newer vaccines in NIS

CO9: Interpret principles and rules for hospital waste management

CO10: Recent advances in diagnostic microbiology: Automation, Nucleic acid based detection methods

PHYSIOLOGY

CO1: Describe Blood- Composition and functions of plasma, hemopoiesis, erythrocytes including Hb, leukocytes and thrombocytes, plasma proteins and their role.

CO2:Explain Composition, functions and regulation of salivary, gastric, pancreatic, intestinal and bile secretions.

CO3: Enumerate Types of neurons and synapses and transmission of nerve impulseacross them, Neurochemistry of vision, gustation, olfaction and hearing.

CO4:Describe Excretory system- Structure of nephron, formation of urine (glomerular filtration, tubular reabsorption of glucose, water and electrolytes), tubular secretion, role of kidneys regulation of blood pressure.

CO5: Explain Rhythmical excitation of heart, basic theory of circulatory function, blood flow and resistance, function of arterial and venous systems.

SEMESTER 2

METABOLISM AND ENZYMOLOGY

CO1: Definition and classification of Enzymes, factors affecting enzyme activity, Enzyme kinetics, Enzyme inhibitors, co enzymes, isoenzymes, Determination of enzymes – comparison of endpoint reaction and rate of reaction methods.

CO2: Types of carbohydrates along with their classification function metabolism and their estimation methods manually or by automation

CO3: Proteins and amino acids : structure, functions, classification, metabolism, normal and abnormal values, along with their estimation methods in routine laboratory

CO4: Biochemistry of lipids, digestion and absorption of lipids. Lipid metabolism, lipo protein, dislipidemia, lipid profile and their estimation methods in laboratory by manual methods as well as automated.

CO5: Structure of DNA, RNA along with their metabolism

CO6: Haemoglobin: its contents, metabolism along with associated diseases and their laboratory diagnosis after estimation.

CLINICAL PATHOLOGY

CO1: Can understand about Fetal and neonatal physiology and pediatric diseases

CO2: Comes to know about Cervical cancer, uterine and ovarian cancers, gestational trophoblastic neoplasia along with various Sexually transmitted diseases and their laboratory diagnosis.

CO3: Red blood cells disorders with basic aspects of anemia , definition, pathophysiology, classification and clinical features and Investigation of anemia in diagnostic pathology.

CO4: WBC disorders: Leukamoid reaction, myelodysplastic syndrome (MDS) – definition, clinical features, peripheral smear and bone marrow findings with associated diseases and their laboratory diagnosis.

CO5: Various Hemorrhagic disorders their definition, pathogenesis, clinical features and classification of vascular, platelet disorders, coagulation disorders and fibrinolysis along with the methods of their determination by manually as well as with automated methods.

CO6: Collection, transport, preservation and processing of various clinical specimens for pathological investigations with the significant and insignificant values.

IMMUNOLOGY AND VIROLOGY

CO1: Explain types of immunity, Structure , functions and responses of Immune system along with antigen antibody and associated assay like ELISA, HA, RIA, CFT etc.

CO2: Describe various menifestations with impair immune system along with their determination methods and laboratory diagnosis.

CO3: Explain General Properties, Nomenclature and Classification of viruses with Morphology, replication, life cycle and pathogenesis of medically important viruses.

CO4: Describe various laboratory tests associated with diagnosis of viral infections e.g, ELISA for HIV, HBsAg, HCV

BIO STATICS AND HOSPITAL MANAGEMENT

CO1: Describe Some Basic Concepts of statistical analysis like Sample and population. Statistical definitions. Random sampling. Testing of hypothesis along with Measurement of central tendency, Measures of variation and Frequency distribution.

CO2: Explain the Concept of Probability along with Test of significance namely Z test, T test, Chi square test, F test.

CO3: Research Statistics pertaining to medical laboratory technology along with

Testing the efficacy of manufacturing drugs and Statistical analysis of instrumental data and comparison of various biological techniques used in hospitals.

CO5: Had some overview for Health care and Hospital Management

CLINICAL AND APPLIED BIOCHEMISTRY

CO1: Able to perform various tests for Kidney, Heart, Liver and Thyroid functioning.

CO2: Explain Hormones their classification , general features, mechanism and site of action, along with significance and estimation in diagnostic laboratory in routine practice.

CO3: Define and demonstrate Electrolytes , minerals, vitamins along with metabolism normal and abnormal values with significance and methods of estimation in diagnostic laboratory.

CO4: Explain and interpret various automated procedures in routine testing with quality control.

BLOOD BANKING, HISTOPATHOLOGY AND CYTOLOGY

CO1: Can understand the various concepts of blood banking along with testing methods e.g., Blood grouping, Rh grouping, coombs test etc.

CO2: Histopathology instruments and reagents along with principles of IHC and other techniques used in histopathological examination.

CO3: Cytological techniques with principles of FNAC and various staining techniques used in exfoliative studies.

CO4: Can understand Quality control and donor screening methods during transfusion practices.

PARASITILOGY AND MYCOLOGY

CO1: Can understand various medical important parasites and fungus along with their morphology , life cycle, pathogenesis and laboratory diagnosis.

CO2: Can comes to know about collection and processing of various specimens for fungal and parasitic disorders.

CO3: Newer techniques and treatment for estimation and diagnosis of various infections.

MOLECULAR BIOLOGY

CO1: Structure of DNA and RNA along with Qualitative and quantitative estimation of nucleic acids and Applications in routine therapy.

CO2: Nucleic Acid analysis, Extraction, purification and analysis of mRNA

CO3: Can understand about Molecular diagnostics,Viral load monitoring, window period along with Role of molecular diagnostics in present diagnostic area.

CO4: Molecular diagnostic of various viral diseases: HIV type -1, HIV type II, HPV, Various hepatitis strains, Influenza (H1N1) etc.

SEMESTER 3

CLINICAL PATHOLOGY PART-II

CO1: Describe Growth and functional development of the fetus, adjustment of the infant to extrauterine life, special functional problems in the neonate, problems of prematurity, congenital anomalies, perinatal infections, syndrome of the newborn, immune hydrops, tumors and tumor like lesions of infancy.

CO2: Explain Sexually transmitted diseases- syphilis, gonorrhea, trichomoniasis, human papilloma virus infection.

CO3: Define Diseases during pregnancy-placental inflammations and infections, ectopic pregnancy, gestational trophoblastic diseases, eclampsia

CO4: Describe Acute inflammation : Vascular changes. Cellular vents, Chemical mediators, inflammation induced cell injury; Chronic inflammation: Chronic inflammatory cells and mediators. Lymphatics and lymph nodes in inflammation, systemic effect of inflammation.

CO5: Enumerate Mechanism of toxic effect, toxicokinetics - chemical carcinogens and teratogens, treatment of intoxication. Response of respiratory system, reproductive system, liver, kidney to toxic agents. Toxic effects of metals, solvents, environmental pollutants.

CLINICAL BIOCHEMISTRY

CO1: Explain Disorders of carbohydrate metabolism: Diabetes mellitus, glycohemoglobins, hypo-glycemias, galactosemia and ketone bodies. Various types of glucose tolerance tests. Glycogen storage diseases.

CO2: Enumerate Disorders of amino acid metabolism- Phenylalanemia, homocystinuria, tyrosinemia, MSUD, phenylketonuria, alkaptonuria, albinism and animoacidurias.

CO3: Describe Physiology of lipids/lipoproteins. Lipidosis. Clinical inter-relationships of lipids (sphingolipidosis and multiple sclerosis), lipoproteins and apolipoproteins. Diagnostic tests for HDL-cholesterol, LDL-cholesterol and triglyceride disorders.

CO4: Explain Diagnostic enzymes: Principles of diagnostic enzymology. Clinical significance of aspartate aminotransferase, alanine aminotransferase, creatine kinase, aldolase and lactate dehydrogenase.

CO5: Define Biochemical aspects of hematology: Disorders of erythrocyte metabolism, hemoglobinopathies, thalessemias thrombosis and anemias. Laboratory tests to measure coagulation and thrombolysis.

MEDICAL LABORATORY TECHNIQUES

CO1: Analysis of amino acids, Screening tests, quantitative tests, test for specific amino acids, determination of proteins in serum, plasma and CSF. Determination of glucose in body fluids, glucose tolerance test and hypoglycemia determination, analysis of ketone bodies, method of estimation of lactate, pyruvate and glycated hemoglobin in blood.

CO2: Molecular genetics of hematopoietic neoplasm-lineage probes in the evaluation of hematopoietic neoplasma- Molecular analysis of chromosomal aberrations in leukemias and lymphomas.

CO3: Interpret DNA analysis; historical aspects advantage of DNA over traditional serology; impact of DNA specimen collection, DNA degradation and environmental damage, quality assurance, standard, databank, legal challenge.

MEDICAL MICROBIOLOGY

CO1: Describe Methods of classification of microorganisms, general characteristics of main groups of microorganisms. Gram +ve and Gram –ve bacteria with structure and functions of peptidoglycan in them. Growth and nutrition, Different phases of microbial growth and physical conditions required, measurement of bacterial growth.

CO2: Explain Culture media and isolation of pure bacterial cultures. Staining methods for bacteria, microbial taxonomy, Bacterial morphology

CO3: Describe Bacterial genetics, pathogenesis, antibacterial agents, drug resistance and drug sensitivity tests, laboratory diagnosis of bacterial infections. Chemical control of microorganisms: Heat, filtration and radiation.

CO4: Describe and interpret Identification of bacteria on the basis of cultural characteristics (morphological and serological features): Staphylococcus and streptococcus including pneumococci, Family Enterobacterial, Haemophilus & Bordetella, Cornyaebacterium and Nessieria & Treponema.

CO5: Describe Air borne infections (Tuberculosis, Whooping cough, Influenza, Pneumonia, streptococcal infections, Diphtheria, Measles, Chicken pox , Mumps), Food and water borne infections (Cholera, Typhoid, Shigellosis, Brucellosis, Gastroenteritis, Amoebiosis, Taeniasis Poliomyelitis, Jaundice) Sexually transmitted diseases (AIDS, Syphilis, Gonorrhoea, Lymphogranuloma venereum.