

Annexure -III

Syllabus for following paramedical Diploma Course

1. Diploma in Medical Laboratory Technology (DMLT) (2 year)
2. Diploma in Radiological Technology (DRT) (2 year)
3. Diploma in Radio diagnosis & Radiotherapy Technology (DRRT)(3 year)
4. Diploma in Ophthalmic Assistance (DOA)(2 year including training of 1 year)
5. Diploma in Operation Theatre & Anaesthesia Technology (DOTAT)(2 year + 6 month internship)
6. Diploma in Cardio Vascular Technology (DCVT) (2 year)
7. Diploma in Neuro Technology (DNT)(2 year +6 month internship)
8. Diploma in Dialysis Technology (DDT)(2 year including internship of 1 year)
9. Diploma in Dental Hygienist (DCDH) (2 year)
10. Diploma in Dental Mechanic (DCDM) (2 year)
11. Diploma in Endoscopic Technology (DET)(2 year+6 month internship)
12. Diploma in Dental Operating Room Assistance (DORA)(2 year)
13. Diploma in Respiratory Technology (DR)(2 year)
14. Diploma in Central Sterile Supply Technology (DCSST)(2 year)
15. PG. Diploma in clinical child Development.

Syllabus of Para Medical Diploma Courses

Conducted by Directorate of Medical Education,

Medical College PO, Thiruvananthapuram

PM-D-01

DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY- (DMLT)

Course Code: PM-D-01

1. COURSE CONTENT

1		
1.1	Title of the course	<u>Diploma in Medical Laboratory Technology (DMLT)</u>
1.2	Aim of the course	To train the students for official approval as medical laboratory technician
1.3	Objective of the Course	1. Aware of the principle underlying the organization of a clinical laboratory. 2. Able to do routine and special investigative procedures in medical laboratory practice. 3. Provide a good theoretical and practical education who plan to work with in the field of medical laboratory technology and science. 4. Upgrade knowledge and skills in a changing healthcare scenario 5. Able to operate and maintain all equipment and automated machine used in laboratory diagnostics. 6. Able to communicate with patients/clients and other health professionals 7. Develop efficient techniques for all forms of written and verbal communication including accurate and timely record keeping
1.4	Medium of instruction	English
1.5	Duration	The duration of the course shall be 2 years. The course shall be conducted under the department of Medical Laboratory Technology and in the institution Hospital Labs There shall be theory classes along with practical and clinical lab training during the course. Duration permitted for successful Completion of the course – 4 years
1.6	Academic eligibility	A pass in the Higher Secondary Examination of the Board of Higher Secondary Education of Kerala or equivalent examinations conducted by any board in India recognized by any of Universities in Kerala with Physics, Chemistry and Biology as optional subjects and a pass with 40% marks in Physics, Chemistry and Biology put together, are eligible. Relaxation of 5% marks will be allowed to SC/ST candidates.

		Indian citizen of Kerala origin is eligible for admission.
		The Candidate should be above the age of 17yrs
1.7	Strength/batch	Not to exceed 30 students per batch
1.8	Reservation	As per existing Government guidelines
1.9	Admission requirement	Selection to the course shall be made by the Director of Medical Education. Selection will be made on merit basis and based on the marks obtained in the qualifying examination. Selection to the management quota in the self-financing institution where the Course is granted and approved by the Government of Kerala, shall be done by following the norms fixed for the same and supervised by competent authority.
1.10	Subjects of study	
1.10.1	First Year (PART-I)	
	Paper-1	Biochemistry -I
	Paper-2	Medical Microbiology - I
	Paper-3	Pathology -I
1.10.2	Second year (PART-II)	
	Paper-1	Biochemistry -II
	Paper-2	Medical Microbiology - II
	Paper-3	Pathology -II

2. DISTRIBUTION OF HOURS

Part I

	2.1 Part-1: Paper-1 Biochemistry -I		2.2 Part-1: Paper-II Medical Microbiology - I		2.3 Part-1: Paper-III Pathology -I	
A	Section A	Hrs	Section A	Hrs	Section A	Hrs
1	LABORATORY PRINCIPLES, INSTRUMENTATION	50	BASIC MICROBIOLOGY	30	ANATOMY	10
2	PHYSIOLOGY	10	GENERAL BACTERIOLOGY	40	HAEMATOLOGY	50
3						
	TOTAL	60		70		60
B	Section B		Section B		Section B	
1	BIOLOGICAL MOLECULES & ESTIMATION	60	IMMUNOLOGY	10	CLINICAL PATHOLOGY	20
2			PARASITOLOGY	40	CYTOLOGY	30
3					CYTOGENETICS	10
4						
	TOTAL	60		50		60
	GRAND TOTAL	120		120		120

Part II

	2.4 Part-II: Paper-1 Biochemistry -II		2.5 Part-II: Paper-II Medical Microbiology - II		2.6 Part-II: Paper-III Pathology -II	
A	Section A	Hrs	Section A	Hrs	Section A	Hrs
1	DIAGNOSTIC BIOCHEMISTRY	60	SYSTEMATIC BACTERIOLOGY	40	BLOOD BANKING	50
2			DIAGNOSTIC BACTERIOLOGY	30		
	TOTAL			70		50
B	Section B		Section B		Section B	
1	ENZYMOLOGY, QUALITY CONTROL & ADVANCED TECHNIQUES	50	MYCOLOGY	20	HISTOTECHNOLOGY	60
2			VIROLOGY	20		
	TOTAL	50		40		60
	GRAND TOTAL	110		110		110

3. DETAILED SYLLABUS

3.1 PART I – PAPER I BIOCHEMISTRY – I

Section A : LABORATORY PRINCIPLES, INSTRUMENTATION INCLUDING PHYSIOLOGY

3.1.1 LABORATORY PRINCIPLES, INSTRUMENTATION (50 hrs)

- **Introduction** - The Course, Categories of Staff in Health Laboratories, Laboratory Technician- Job description, Ethics- Responsibility of Laboratory- technician. Interpersonal relationship of Laboratory technician with other staff members in health care system,
- **Introduction to Bio-chemistry.**
- **Laboratory glass wares** -General laboratory wares -glass & plastic, glasses – composition ,properties & verities, grades of glass-wares, testing of new glass-wares & storage of glass-

wares, preparation of cleaning solutions, cleaning of new and used glass-ware in Biochemistry, calibration of volumetric glass-ware.

- **Preparation of pure water**-Preparations of distilled water, double distilled water and de-ionized water-testing the conductivity of the distilled water and its storage.
- **Measurements** - Units of measurements, SI units, Methods of measuring liquids and weighing chemicals.
- **Laboratory instruments** - Working -principle, use and maintenance of the following instruments / apparatus - Heater, centrifuge, water-bath, refrigerator, vortex mixer, magnetic stirrer, Homogenizer, incubator, densitometer, desiccators, Balances -analytical, single pan balance -electrical and electronic balances.
- **Laboratory organization** - General principles of organization of a clinical laboratory, ventilation, lighting, work benches, water and waste water. Chemicals / reagents and its storage.
- **Laboratory safety** - Laboratory hazards in clinical laboratories, safety measures & first aid principle.
- **Preparation of solutions** - Expressions for concentrations, preparation of standard solutions -Normal, Molar, Saturated and Half Saturated solutions volumetric analysis, preparations of sodium hydroxide, hydrochloric acid, sulfuric acid & nitric acid, potassium permanganate and silver nitrate.
- **Laboratory Management** - Familiarization of Request forms and report forms. Ordering and Utilization of supplies, Maintenance of Stock Registers- Consumables, Non-consumables Accreditation and Certification of Laboratories
- **pH and buffers**- definition and understanding, pH-scale, Henderson –Hassel balch equation, methods of determination of pH, pH meter, buffer action & buffer solution, phosphate buffer, carbonate - bicarbonate buffer and citrate-citric buffer, body buffer systems, acidosis, alkalosis, ABG analysis.
- **Collection and preservation of Biological specimens** - and processing of biological specimens such as blood, urine, CSF and other body fluids for biochemical analysis, anticoagulants, urine preservatives, causes of haemolysis of collected blood, biochemical changes of collected blood on keeping.
- **Photometry** - spectrum of light, monochromatic light, wavelength of light, color of solutions, absorption and transmission of light. colorimeter- working principle, parts, calibration, selection of filters, colorimetric analysis, spectrophotometer, phototube,

photomultiplier, flame photometer, briefly about -flurimetry, turbidimetry and nephelometry.

3.1.2 PHYSIOLOGY - 10 hrs

- **Blood physiology** - Functions of blood, plasma proteins
- **Digestive system** - Name the important regions. Important functions of liver & stomach, briefly on Digestion of carbohydrates, proteins & lipids. bile composition & function, gastric secretion- composition, collection, stomach tubes.
- **Urinary system** - Name the Important regions & functions of kidney, Nephron, formation of urine, Osmosis, Dialysis.
- **Cardiovascular system** - Important functions of heart, one method of BP determination in man, normal ECG. Atherosclerosis
- **CSF** - Briefly its composition, functions & Lumbar puncture.
- **Endocrine system** - Endocrine glands – names, their secretions

Section B: BIOLOGICAL MOLECULES & ESTIMATION - 60 hrs

3.1.3 BIOLOGICAL MOLECULES & ESTIMATION

- **Carbohydrates** - Basic knowledge- Biological functions and classification, properties and reactions of carbohydrates, definitions of glycolysis, glycogenesis, glycogenolysis and gluconeogenesis, estimation of plasma sugar- principles and estimation of various methods-chemical & enzymatic, Glucose-tolerance test, glucose challenge test, ketosis, pentosuria, Bial's test, renal- glycosuria, renal threshold value, diabetes mellitus, regulation of blood sugar, glycated haemoglobin, diabetic panel of investigations, Reducing substances in urine.
- **Proteins** - Basic knowledge- biological functions, classification of plasma proteins, Denaturation of proteins, protein precipitants, half saturation and full saturation tests, essential-amino-acids, peptide bond, Iso-electric pH, estimation of serum proteins- principles of various methods and estimation of total protein, albumin, globulin & A/G ratio determination, estimation of micro-albumin. **Non protein nitrogenous substances in blood** - briefly about the formation of urea, uric acid, creatinine and creatine in the body and their estimations in serum and urine, Jaffe's-reaction, Berthlot reaction,

- **Lipids** - Basic knowledge- Biological functions and classification of lipids, briefly about fatty acids-EFA and PUFA, saponification , TAG, Liebermann - Burchard - reaction, Salkowski's reaction, Zimmermann reaction, , serum total cholesterol, HDL cholesterol and their estimations-non-enzymatic, enzymatic methods ,lipoproteins, atherosclerosis, bile acids and bile salts, fasting lipid profile .
- **Nucleic acid** - brief knowledge about DNA and RNA. gout
- **Electrolytes and Mineral** -Serum calcium and serum phosphorus - their important biological- functions, estimations in serum and urine, Sulkowichs-test, serum electrolytes, estimations of sodium, potassium, chloride and bicarbonate in serum.
- **Analysis of Body fluid** - CSF, pleural and peritoneal- fluids- collection, physical analysis, and chemical analysis for protein, sugar and chloride.

3.1.4 Practical- PART I – PAPER I BIOCHEMISTRY – I 200 Hours

Laboratory principles, instrumentation, Estimation

- Students should acquire, during the course, practical experience in preparing solutions/ reagents, methods of weighing chemicals, measuring liquids. They should be well experienced in the collection of blood, separation of plasma/ serum and their preservation. They should have thorough practical experience in doing the estimations in body fluids & proper maintenance of all types of equipments/ instruments routinely used in clinical Biochemistry laboratory.
- Familiarization of laboratory-wares used in Biochemistry laboratory
- Demonstration of preparation of distilled water, double distilled water & de-ionized water.
- Weighing of chemicals, Preparation of cleaning solutions in Biochemistry- and cleaning procedure.
- Calibration of pipettes by gravimetric method, measurements of liquids.
- Preparation of standard solutions- normal, molar & percentage, also saturated and half saturated solutions.
- Preparation of standard solutions of oxalic acid, sodium hydroxide, hydrochloric acid, sulphuric -acid, Nitric -acid, potassium permanganate.
- Preparation of buffer solution & checking of pH- phosphate buffer, carbonate buffer & citrate buffer.

- Demonstration of osazones of glucose, fructose, lactose & maltose.
- Standardization of a colorimeter and selection of filters.
- Preparation of fluoride-oxalate anticoagulant bottles.
- **Estimation of following in serum/plasma**
- Sugar – Non enzymatic method, enzymatic method.
- Total protein,- albumin –& A/G ratio determination
- Total cholesterol, HDL cholesterol.- Non enzymatic method, enzymatic method
- Urea- Non enzymatic method, enzymatic method
- Uric acid. – Non enzymatic method, enzymatic method
- Creatinine & creatin. Non enzymatic method, enzymatic method
- Phosphorus,-calcium –& chloride,
- Sodium and potassium
- Standardization of Sugar by non enzymatic method.
- **CSF-analysis** - Estimations of proteins, glucose and chloride.
- **Estimation of the following in urine** – Protein, Urea, uric acid, creatinine, Phosphorous, calcium, chloride

RECOMMENDED BOOKS

1. An Introduction to medical laboratory y technology - Baker - P Silvertreen.
2. Medical Laboratory Technology - Kanai. L. Mukharjee
3. Medical Laboratory Manual for Tropical Countries Vol-1 Monica Cheesbrough
4. Harper's Biochemistry: R. K. Murray and Grannor
5. Test book of Biochemistry: Vasudevan and Sreekumari
6. Practical – Clinical Biochemistry - Volume 1: Harold Varley

REFERENCE BOOKS

1. Clinical Biochemistry - Principles and Practice: Praful B. Godkar
2. Text book of medical laboratory technology – Ramnik sood
3. Hand book of Medical Laboratory Technology : Robert H. Carman
4. CLINICAL LABORATORY METHODS AND DIAGNOSIS - GRADWAL

3.2 PART I-PAPER II MEDICAL MICROBIOLOGY –I - 120 Hours

Section: A - BASIC MICROBIOLOGY & GENERAL BACTERIOLOGY

3.2.1 BASIC MICROBIOLOGY - 30 Hours

- **Introduction to Microbiology**
- **History** -Contributions of E. Jenner, L. Pastuer, Robert Koch and postulates, Antonie van Leeuwenhoek, Alexander Fleming
- **Microscopy** - Principles, methods of working, different parts, care and use of following microscopes - Bright field monocular & binocular, Phase contrast, Dark ground, Fluorescent , Electron microscope.
- **Laboratory safety** – Laboratory hazards and safety measures, universal safety precautions. Classification of microbes on the basis of hazards. Principles of classifications of laboratory safety cabinet and its applications.
- **Sterilization and disinfection** - Definitions of sterilization, disinfection, antisepsis. Classification of sterilization and disinfection, Physical methods- Heat- Dry heat-Hot air oven, ,Flaming, Incineration, Moist heat –classification- at, below, above 100°C- Autoclave- Different types, principles, operating procedures, precautions, applications and quality control. Filtration, Radiation. Chemical methods -Factors influencing the performance of the chemical disinfectants, Different types of chemical agents used for disinfection and mode of action. Cleaning of glass wares in microbiology.
- **Biomedical waste management** – Segregation, treatment and disposal methods of waste.
- **Morphology of bacteria** – Shape of bacteria, structure of bacterial cell-cell wall, capsules, flagella, fimbriae, bacterial spores.
- **Techniques of observing bacteria**- Unstained preparation – Wet mount, Hanging drop.
- **Stained preparations** – Preparation and fixation of smear. Staining- Principles, preparation of reagents, procedures, uses of the following staining method- Simple, Differential -Gram's staining, Acid fast, Negative staining, special- capsule, spore, volutin granules.

3.2.2 GENERAL BACTERIOLOGY – 40 Hours

- **Bacterial growth and nutrition** – Nutritional, Environmental requirements, growth curve
- **Bacterial Culture media** – Preparation of culture media- method, ingredients, pH adjustments, sterilization, quality control and storage of different types of media. Classification - Basal - Peptone water, Nutrient broth, Nutrient agar, Enriched - Blood agar, Chocolate agar, RCM, Enrichment - Alkaline- Peptone Water, Selenite F broth, Selective - MaC conkey agar, XLD, DCA, TCBSA, L.J.medium, Tellurite blood agar, Differential - CLED. Transport media, Anaerobic media. Dehydrated culture media.

- **Cultivation of Bacteria** - Equipments and devices used in the inoculation of bacteria, Inoculation methods- media in Petri dish- pour, spread, streak plate methods, Slopes, Butt, Broth.
- **Incubation methods** – Incubators, Water bath, Carbon dioxide incubation, Anaerobic incubation- anaerobic jar, gas pack system.
- **Growth characteristics** – Colony morphology of bacteria on solid media, liquid media.
- **Biochemical Tests for identification** - principle, preparation of media, reagents used, different methods, interpretation and quality control for the following identification tests. Tests for the metabolism of Carbohydrates- OF test, simple sugar media, TSI/KIA, Mannitol motility, citrate utilization, MR, VP tests, Tests for the metabolism of proteins and Amino acids- Indole, PPA, Amino acid decarboxylase test. Tests for enzymes. - Catalase, Urease, Nitrate reductase, Coagulase, and Oxidase, Commercial identification systems- API

Section: B - IMMUNOLOGY & PARASITOLOGY

3.2.3 IMMUNOLOGY – 10 Hours

- **Introduction to immunology** – Types of immunity and classification.
- **Antigen**- Definition, Hapten, Factors influencing immunogenicity.
- **Antibody**- Structure of antibody, Types of antibody- Ig G, IgM, IgA, IgD, Ig E
- **Antigen Antibody reactions** – definitions of Specificity, Sensitivity, Prozone, Titer, Agglutination, precipitation, Complement fixation, Neutralization, ELISA- Direct, Indirect, Sandwich/capture, Immuno-Fluorescence, RIA, Immunochromatographic test (Lateral flow assay)- cassette, strip format, Flow through assay.
- **Vaccines**.(Brief knowledge only)

3.2.4 PARASITOLOGY – 40 Hours

- **Introduction to parasitology** - Definition – Parasite, host, vector
- An elementary knowledge of the morphology, life cycle, pathogenesis, laboratory diagnosis of parasites belonging to the following genera with reference to the forms seen in human pathological material and the methods used to identify them
- **Protozoa** – Amoeba- Entamoeba histolytica, Free-living pathogenic amoeba- Naegleria fowleri, Acanthamoeba species, Balamuthia mandrillaris, Flagellates- Intestinal- Giardia lamblia, Genital- Trichomonas vaginalis, Hemoflagellates- Leishmania donovani, Trypanosomes.
- **Sporozoa** - Malarial parasite, Toxoplasma gondii, Cryptosporidium parvum, Balantidium coli

- **Helminths** – Nematodes- Intestinal- *Trichuris trichiura*, *Enterobius vermicularis*, *Ascaris lumbricoides*, *Ancylostoma duodenale*, *Necator americanus*, *Trichinella spiralis* Lymphatics - *Wuchereria bancrofti*, *Brugia malayi* , *Dracunculus medinensis* (guinea worm)
- Cestodes - *Taenia solium*, *Taenia saginata*, *Echinococcus granulosus*, *Hymenolepis nana*.
- Trematodes - *Schistosoma haematobium*, *Fasciola hepatica*, *Fasciolopsis buski*, *Paragonimus westermani* (Basic knowledge only)
- **Diagnostic Methods in Parasitology** – Collection and transport of specimens for parasitological examination- **Faeces**- Macroscopy, Microscopy-saline, Iodine preparation, concentration methods. **Blood**- Thick, thin smear, staining, QBC, Rapid card test for Malaria, *Microfilaria*

3.2.5 Practical- PART I-PAPER II MEDICAL MICROBIOLOGY –I 200 Hours

- **BASIC MICROBIOLOGY – 80 Hours**
- Demonstration of various parts of light microscope, Should be thorough to the work with light microscope
- Cleaning of new & used glass-wares for microbiological purposes.
- Should be familiar with the use of autoclave, hot air oven, water bath, incubator.
- Demonstration of physical methods of sterilization – sterilization of glass wares, liquids, plastics and other laboratory wares, heat labile fluids.
- Familiar with different type of filters & decontamination techniques.
- Detection of motility – Hanging drop method, semi solid agar method
- Preparation of smear, fixation, preparation of stains and reagents for the following staining techniques- Simple Staining –Methylene- blue, dilute carbol fuchsin, Gram's, AFB Staining – Ziehl – Neelsen, staining.
- Negative staining for capsule.
- Special staining for bacterial spore, volutin granules.

1. GENERAL BACTERIOLOGY – 100 Hours

- pH adjustments-Preparation of pH indicator solutions, Preparation of 1N, 0.1N, HCl & NaOH for -Adjustment of pH using Lovibond comparator.

- Preparation of following culture media -Peptone water, Nutrient broth, glucose broth, Nutrient agar, Blood agar, Chocolate agar, Mac-conkey agar, RCM, Alkaline peptone water, SeleniteF broth, XLD, TCBS, LJ medium, Carry & blair media
- Biochemical media & reagents for biochemical tests- Hugh & Leifson's media, GLSM, Gppw, Mannitol motility media, urease medium, Simon's citrate medium, Nitrate broth, TSIA, PPA, Reagents – Methyl red indicator, VP reagents, Nitrate reagents, H₂O₂, Oxidase reagent, Ehrhich's reagent
- Inoculation methods on plate media, liquid media, slope media
- Incubation & Isolation of pure culture & study colony characters on different media
- Anaerobic cultivation methods & familiar with anaerobic-jar with quality control.

2. PARASITOLOGY – 20 Hours

- Macroscopic & microscopic examination of faecal sample for adult worm, ova, cyst, larvae of medically important parasites
- Concentration technique for intestinal parasites in stool
- Preparation, staining & examination of blood smear for blood parasites – malaria, microfilaria

RECOMMENDED BOOKS

1. Mackie & Macartney Practical medical Microbiology - Collee, Fraser, Macmion, Simmons
2. Medical Laboratory Manual for Tropical Countries Vol-1 & Vol - 2 Monica Cheesbrough 2nd Edition
3. Essentials of Medical Microbiology by Apurba S. Sastry, Sandhya Bhat 2nd Edition
4. Microbiology and Parasitology Prep Manual For Undergraduates 3rd Edition by B. S. Nagoba, Asha pichare
5. Textbook of Microbiology By Dr. C.P. Baveja
6. Ananthanarayan and Paniker's Textbook of Microbiology by Ananthnarayan, Paniker, Arti Kapil 9th Edition
7. Paniker's Textbook of Medical Parasitology by Sougata Ghosh 8th Edition
8. Essentials of Medical Parasitology by Apurba S. Sastry, Sandhya Bhat
9. Medical Parasitology by V. Baveja, C.P. Baveja

3.3 PART I- PAPER III PATHOLOGY - I - 120 Hours

Section A :

3.3.1 ANATOMY (10 hrs)

- **Basic Anatomy** – Electron microscopic structure of a human cell, classification and functions of microscopic structures of tissues – Epithelial tissue, connective tissue.
- **Respiratory system** – Basic structure of trachea and lung
- **Digestive system** – Histology of oral cavity, tongue, pharynx, liver, gall bladder, large intestine colon, appendix.
- **Urinary system** – Kidney, nephron, ureter, urinary bladder, urethra
- **Reproductive system** – Male reproductive system – testis, seminiferous tubules, epididymis, seminal vesicles, external genitalia of male. Female reproductive system – vagina, cervix, uterus, fallopian tube, ovary, ovarian follicles.

3.3.2 HAEMATOLOGY (50hrs)

- **Introduction to haematology** –Haemopoiesis- Sites of haemopoiesis in foetus and adults, stages of development of RBCs, WBCs and platelets, brief description of megaloblastic maturation, extramedullaryhaemopoiesis, regulation of haematopoiesis, morphology and functions of normal blood cells, abnormal RBCs and WBCs
- **Anticoagulants and vacutainers**
- **Methods of blood collection** – Capillary blood collection, venous blood collection.
- **Blood cell counting** –Haemocytometers, RBC, WBC, Platelet, Reticulocyte count- supravital staining – Errors in all cell counts- Automated cell counters-principles, calibrations, interpretation of pattern of blood count print, quality controls used in the cell counts
- **Preparation of blood smears** – Thin and thick smears
- **Staining of blood smears** – Principles of staining, Romanowsky stains – Leishman stain, Wright stain, Jenner stain, MGG stain, Jenner-Giemsa stain – Thick smear staining- JSB stain, Field stain
- **Examination of bone marrow specimens** – Bone marrow aspirate and trephine biopsy
- **Haemoglobin** – Function, normal and abnormal haemoglobins, introduction to haemoglobinopathies, thalassaemia –Methods of haemoglobin estimation, Alkali denaturation for HbF, Kleihaures acid elution test, sickling test, Hb electrophoresis,
- **LE cell preparation**

- **ESR and PCV**- Principles and procedures of different methods, clinical significance
- **Red cell indices** – MCV, MCH, MCHC, colour index, RDW and their clinical significance
- **Osmotic fragility of RBCs**
- **Leukaemia** – Definition, classification – Acute, chronic, myelocytic, lymphocytic, monocytic, eosinophilic etc . WHO classification(brief), Cytochemical stains used in haematology – Myelo peroxidase, PAS, LAP, Esterase, Perls stain
- **Anaemia** – Definition, classification – morphological, ethiological, Iron deficiency anaemia, Megaloblastic anaemia, Aplastic anaemia, Haemolytic anaemia
- **Haemostasis and coagulation** – Mechanism of normal haemostasis, components of haemostasis, coagulation factors, coagulation pathways, vitamin K dependent factors, tests for haemostasis and coagulation, tests for vascular function, tests for platelet function, tourniquet test, bleeding time, clot retraction test, other platelet function tests. Tests for coagulation - whole blood clotting time, prothrombin time, activated partial thromboplastin time, thrombin time, mixing experiments, basic principles of factor assay. Automation in coagulation study. Disorders of haemostasis and coagulation – disorders of platelets, disorders of coagulation, haemophilia- A1, B1,C, Von Willebrand's disease, deficiencies of other coagulation factors.

Section B :

3.3.3 CLINICAL PATHOLOGY

(20hrs)

- **Urine analysis** – Introduction, collection and preservation of urine specimens. Physical, chemical and microscopical examination of urine.
- **Stool examination** – Detection of parasitic ova, occult blood in stool
- **CSF, sputum, semen examinations and pregnancy tests**
- **Examination of other body fluids, Transudates and exudates**

3.3.4 CYTOLOGY (30 hrs)

- **Introduction** – Organisation of cytology laboratory, comparison of applications of cytology and brief knowledge of exfoliative and hormonal cytology.
- **Collection and processing** –Collection of specimens, preparation of smears, cytocentrifuge, fixation.
- **Staining** – Brief knowledge of common stains used in cytology – Papanicolaou staining, Shorr staining, MGG staining.
- **FNAC**
- **Quality control measures in cytology**
- **Automation in cytology**

3.3.5 CYTOGENETICS

(10 hrs)

- **Introduction** – Brief knowledge of metaphase preparation from blood and bone marrow specimens and karyotyping
- **Barr body** – Demonstration using buccal and vaginal smears
- **Common cytogenetic abnormalities**

3.3.6 Practical - PART I- PAPER III PATHOLOGY - I - 200 Hours

1. Haematology (80hrs)

- Preparation of anticoagulant bottles
- Blood collection- Capillary and venous blood collection techniques, collection of blood for various tests, preservation, storage and transportation
- Blood cell counting – Manual methods – RBC, WBC, platelet, eosinophil and reticulocyte counts (pipette dilution and bulk dilution), automated cell counters
- Preparation of blood smears – thin and thick smears
- Staining – Thin blood smears – Leishman staining, differential leucocyte count, identification of normal and abnormal cells. Thick blood smear – JSB staining, Leishman staining, Field staining. Demonstration of blood parasites – Malaria, Microfilaria, Leishmania.
- Haemoglobin estimation - different methods – Manual – Sahli's method, cyanmeth haemoglobin method - Automated methods
- Detection of abnormal haemoglobin
- PCV determination – macro and micro methods, automated methods
- Preparation of buffy coat smears and its staining.
- Calculation of red cell indices.
- Estimation of ESR by manual and automated methods.
- LE cell preparation.
- Tests for haemostasis and coagulation – Tourniquet test, clotting time, bleeding time, APTT, prothrombin time, thrombin time.

2. Clinical pathology (60 hrs)

- Urine analysis, examination of CSF, stool and sputum
- Examination of body fluids – transudates and exudates
- Semen analysis
- Pregnancy tests

3. Cytology (50 hrs)

- Collection of specimens, processing and staining procedures – Papnicolaou stain, Shorr stain, MGG staining, Identification of normal cells of cervical smear

4. Cytogenetics (10 hrs)

- Demonstration of metaphase preparation
- Demonstration of Barr body

RECOMMENDED BOOKS

1. General Anatomy – Chaurasia
2. Practical Haematology – Dacie & Lewis
3. Medical Laboratory Methods – Dr. Ramnic Sood
4. Introduction to Medical Laboratory Technology – Baker

REFERENCE BOOKS

1. De Gurchy's Clinical Haematology in Medical Practice – de Gurchy
2. Clinical diagnosis & management by laboratory methods – John Bernard Henry
3. Wintrobe's Clinical Haematology vol I & II
4. Clinical laboratory methods and diagnosis – Gradwohl
5. Handbook of Medical Laboratory Technology – Robert H. Carman
6. Lynch's Medical Laboratory Technology – Raphael
7. Exfoliative cytology in gynaecological practice : Erisa G Wachtel

3.4 PART II- PAPER I BIOCHEMISTRY –II (110 Hours)

Section A : DIAGNOSTIC BIOCHEMISTRY - 60 hrs

3.4.1 DIAGNOSTIC BIOCHEMISTRY

- **Liver function tests** - Functions of liver, briefly about the formation of bilirubin, jaundice, estimation of serum bilirubin, LFT- routine laboratory tests
- **Gastro intestinal function tests** - Stomach tubes, FTM, gastric analysis, chemical-examinations for starch, blood, lactic acid and bile pigments in gastric juice, determination of free acid and total acid, tubeless gastric analysis.
- **Kidney function tests** - Functions of kidney, clearance tests- urea- clearance, creatinine - clearance, concentration- dilution test. GFR ,Estimation of urea and creatinine,

- **Urine analysis-** collection, preservation, normal and abnormal constituents present in urine, physical - examinations of urine, chemical detection of the following constituents present in urine- reducing sugars, ketone bodies, proteins, occult blood, bile salts and bile pigments, urobilinogen, strip tests and tablet tests (ketostrix, ace test, glucostrix), urobilin, porphobilinogen, Bence Jones Protein.
- **Urinary screening tests for metabolic disorders-** Ninhydrin test, Cyanid nitroprusside test, Ferric chloride test, Benedict's test, DNPH test, estimations of VMA. 17-keto steroids and 5-HIAA in urine, urinary calculi -qualitative chemical analysis.
- **Thyroid function tests -** TFT -estimations of T3, T4 & TSH.

Section B :

3.4.2 ENZYMOLOGY, QUALITY CONTROL & ADVANCED TECHNIQUES- 50 hrs

- **Enzymology** - Enzyme classes, factors affecting enzyme activity, Km value, coenzymes, iso-enzymes-examples: CPK ,LDH, enzyme assays-two point assay and kinetic- assay, units of enzyme activity, definitions of- IU of enzyme activity, katal , KAU, Somogyi's unit, transamination, hepatic enzymes and cardiac enzymes, Assay of the following serum enzymes- ALT, AST, ALP,ACP, CK, LDH and amylase, Ceruloplasmin. Troponin-test, PSA, use of enzymes as reagent
- **Electrophoresis** - definition, principles of various methods. Separation of serum protein fractions by gel- electrophoresis, factors affecting the electrophoresis, Electrophoretogram - Normal pattern & examples for abnormal pattern, electro-endosmosis, SDS- PAGE ,iso-electric focusing.
- **Chromatography** - definition, stationary phase, mobile phase, principles of adsorption chromatography, ion exchange chromatography, separation of amino acids present urine by using paper- one-dimentional chromatography, Rf- value, Partition-coefficient
- **Quality control in Clinical chemistry laboratories** - accuracy, precision, sensitivity, specificity, variables- analytical, pre analytical & post analytical, Systematic- errors and random errors, Standard deviation, QC programs, quality control materials, L J chart.

- **Automation in clinical biochemistry** - definition, advantages & disadvantages, briefly about parts of an analyzer, types of analyzers-continuous analyzers, discrete analyzers, batch analyzers, stat analyzers, semi-analyzer, fully automated analyzers, advantages, dry chemistry analysis.
- **Point of care test in clinical biochemistry.**
- **Ion selective electrode.**
- **CLIA & RIA-** principle and a brief introduction

3.4.3 Practical- PART II- PAPER I BIOCHEMISTRY –II – 150 Hours

- Estimation of serum bilirubin - by Malloy and Evelyn method
- Determination of urea clearance and creatinine clearance
- Enzyme assays - Two point method & Kinetic method, Serum ALT -by Reitman's and Frankel's method, kinetic method. serum AST - by Reitman's and Frankel's method, kinetic method. serum ALP - by method using 4- amino anti-pyrene, kinetic method. serum ACP - by method using 4- amino anti-pyrene, kinetic method. serum amylase - Saccharogenic method Henry and Chiamori's -method, iodometric method, kinetic method.
- Estimation of Serum ceruloplasmin
- Separation of proteins fractions in serum by gel electrophoresis
- Urine- Physical analysis ,Chemical analysis for abnormal constituents- reducing sugars-Benedicts qualitative test, ketone bodies - Rothera's test, proteins - heat & acetic acid test, occult blood - Benzidine- test, bile salts - Hay's test, bile pigments - Fouchet's test, urobilinogen - Ehrlich's test.
- Urine amino-gram, Estimation of 5-HIAA, spot tests for VMA & 17- keto-teroids. Ninhydrin test, Cyanid nitroprusside test, Ferric chloride test, Benedict's test, DNPH test
- Familiarization and usage of all types of auto analyzer. Estimation of biochemical parameters by auto analyzers.

RECOMMENDED BOOKS

1. Text book of Biochemistry- DM.Vasudevan and Sree kumari. S
2. Text book of clinical chemistry -Nobert. W. Teitz
3. Practical clinical biochemistry -Harold. Varkey-vol.I & Vol. II
4. Clinical Biochemistry-Principles & Practice - Praful. B. Godkar

REFERENCE BOOKS

1. Clinical Diagnosis and Management by Laboratory methods – John Bernnard Henry
2. Linch's Medical Laboratory Techniques – Raphel
3. Practical Clinical Biochemistry methods and interpretation- Ranja Chawla 3rd edition

3.5 PART II – PAPER II MEDICAL MICROBIOLOGY –II- 110 Hours

Section A - SYSTEMATIC & DIAGNOSTIC BACTERIOLOGY

3.5.1 SYSTEMATIC BACTERIOLOGY – 40 Hours

A detailed study of general characters, classification, morphology, staining characters, cultural characteristic, biochemical reactions, pathogenesis, clinical manifestation, laboratory diagnosis, of the following bacteria.

- Staphylococcus, Streptococcus, Pneumococcus, Neisseria
- Corynebacterium, Bacillus, Clostridium
- Enterobacteriaceae - Escherichia, Klebsiella, Proteus, Serretia, Salmonella, Shigella, Yersinia
- Vibrio , Pseudomonas, Haemophilus, Helicobacter, Campylobacter, Bordetella, Brucella
- Mycobacteria, Actinomyces, Nocardia,
- Spirochaetes, Chlamydia, Rickettsiae, Mycoplasma
- Normal flora in a healthy human body

3.5.2 DIAGNOSTIC BACTERIOLOGY – 30 Hours

- **Specimen Processing** - Collection, preservation, transport and processing of clinical specimens for the diagnosis of bacterial infections.- Urine, Pus, CSF, Blood, Stool, Rectal swab, Body fluids, Exudates, Sputum, Throat swab, Eye specimens, Ear specimens.
- **Antibiotic Susceptibility Tests** -Disk Diffusion Method, Medium - Mueller-Hinton agar (MHA), preparation of antibiotic disc and storage , selection of disc, Kirby-Bauer , Stokes, Epsilometer or E-test.
- **Automation in medical microbiology** – Brief knowledge only.

- **Bacterial Serology** - principle, reagents used, Procedure, interpretation of following tests
Widal test, VDRL Test, RPR, TPHA, ASO Test, Brucella agglutination test, RF
- **Public health microbiology** – Bacteriology of water, Bacteriology of milk, Hospital acquired infections.

Section B - MYCOLOGY & VIROLOGY

3.5.3 MYCOLOGY – 20 Hours

- **Introduction to Mycology**-Morphological Classification – Yeast, Yeast- like, Molds, Dimorphic fungi
- **Fungal infections** - Basic knowledge of following of fungal infections, its causative agents, clinical manifestation and its Laboratory diagnosis.
- **Superficial mycoses** - Tinea versicolor, Tinea nigra, Piedra, Dermatophytosis
- **Subcutaneous mycoses** – Mycetoma, Sporotrichosis, Rhinosporidiosis
- **Systemic mycoses** – Histoplasmosis. Coccidioidomycosis, Paracoccidioidomycosis.,
Opportunistic mycoses – Candidiasis, Cryptococcosis, Aspergillosis, Penicilliosis,
- **Laboratory diagnosis of fungal infections**- Specimen collection- skin scrapping, hair, nail, pus, sputum, blood, Cerebrospinal fluid (CSF) , tissue, Transport, Processing- Microscopy - Potassium hydroxide (KOH) preparation, India ink/ nigrosin stain, Calcofluor white, Lactophenol Cotton Blue (LCB), Culture- Media- Sabouraud–dextrose agar (SDA), Slide culture

3.5.4 VIROLOGY- 20 Hours

- **Laboratory diagnosis viral Infections** - Specimen collection, Transport, Preservation, Processing-Direct Demonstration of Virus- Electron microscopy, demonstration of inclusion bodies, Isolation of Virus, Detection of viral antigens, Detection of the viral Specific Antibodies, Western blot.
- **Molecular diagnostic methods**- PCR-, RT-PCR-, Real time PCR-, Real time RT-PCR(a brief introduction)

3.5.5 Practical- PART II – PAPER II MEDICAL MICROBIOLOGY –II 150 Hours

1. SYSTEMATIC BACTERIOLOGY – 60 Hours

- Identification of the following bacteria Staphylococcus, Streptococcus, Pneumococcus, Escherichia, Klebsiella, Proteus, Salmonella, Shigella, Vibrio , Pseudomonas,

2. DIAGNOSTIC BACTERIOLOGY – 70 Hours

- Familiar with collection, transportation & processing of the following clinical specimen like blood, urine, pus, sputum, Throat swab, CSF, stool, exudates
- Antibiotic Susceptibility Testing - Kirby-Bauer , Stokes method & interpretation
- Serology- Familiar with following techniques and its interpretations-Widal test, VDRL, RPR, ASO test, RF test (Latex agglutination), ELISA.
- Molecular diagnostic – PCR, CBNAT (Observation only)

3. MYCOLOGY – 20 Hours

- Collection, transport & processing of specimen for fungal culture-KOH preparation, LPCB preparation, Slide culture technique, Germ tube test for yeast identification

RECOMMENDED BOOKS

1. Mackie & Macartney Practical medical Microbiology - Collee. Fraser, Mar mion, Simmons
2. Medical Laboratory Manual for Tropical Countries Vol-1 & Vol - 2 Monica Cheesbrough 2nd Edition
3. Essentials of Medical Microbiology by Apurba S. Sastry , Sandhya Bhat 2nd Edition
4. Microbiology and Parasitology Prep Manual For Undergraduates 3rd Edition by B. S. Nagoba , Asha pichare
5. Textbook of Microbiology By Dr. C.P. Baveja
6. Ananthanarayan and Paniker's Textbook of Microbiology by Ananthnarayan ,Paniker , Arti Kapil 9th Edition

REFERENCE BOOKS

1. Textbook of Diagnostic Microbiology 6th Edition by Connie R. Mahon , Donald C. Lehman
2. Bailey and Scott's Diagnostic Microbiology : by Patricia Tille, 14th Edition

3.6 PART II – PAPER III (PATHOLOGY - II)

Section A: BLOOD BANKING

3.6.1 BLOOD BANKING (50hrs)

- **Introduction to transfusion medicine** – Basic knowledge of ABO blood group system, inheritance and biochemistry of A,B and H antigens, Bombay blood group, characteristics of ABO antigens
- **ABO blood group system** – Principles and methods of ABO grouping in detail, serum grouping, cell grouping, antibody titration, preparation of cell suspension, ABO grouping sera, lectins used in blood bank, numerical scoring and grading of agglutination reaction in

blood grouping, zone phenomenon, problems in interpretation of agglutination reactions and their remedies.

- **Rh blood group system** – Inheritance of Rh antigens, Rh antigens including Du antigen, Du testing, significance of Du testing, Rh antibodies, Rh grouping methods – saline, albumin and enzyme methods, problems in Rh grouping
- **Other blood group systems** – (brief knowledge)
- **Coomb's test** – Introduction, principle, Coomb's reagents – different types – Direct, Indirect, Clinical applications of Coomb's test, errors in Coomb's test
- **Blood collection and processing** – Donor selection and screening, donor registration.
- **Preservation and storage of blood in blood banks** – Anticoagulant preservative solutions used in blood banks – ACD, CPD, CPDA1, CPDA2, Additive solutions –preparation of pyrogen free water.
- **Compatibility testing (pre transfusion testing)** – Cross matching – major and minor
- **Brief introduction of component therapy** – Preparation, storage, transportation, indication of uses of blood components like packed red cells, Leucodepleted red cells, PRP, platelet concentrate, FFP, cryoprecipitate, single donor plasma
- **Apheresis** – Brief introduction
- **Haemolytic diseases of newborn** – Lab diagnosis, exchange transfusion in HDN
- **Transfusion reactions** – Definition, different types, Investigation in haemolytic transfusion, Transfusion transmitted disease.
- **Quality control in blood bank, standard operation procedures and their maintenance.**
- **Automation and recent developments in blood banking**

Section B: HISTOTECHNOLOGY

3.6.2 HISTOTECHNOLOGY (60 hrs)

- **Introduction to histology**
- **Organisation to histopathology laboratory** – Specimen reception, handling and numbering
- **Fixation** – Definition, ideal fixative, classification of fixatives, common fixatives – mercury fixative, picric acid fixative etc, formalin fixation in detail, removal of formalin pigment
- **Decalcification** – Principle, different methods, preparation of reagents, end point determination and qualities of ideal decalcifying agent
- **Tissue processing** – Dehydration, clearing, impregnation, embedding. Routine paraffin, others including resinous embedding media. Blocking. Defects in tissue processing and rectification of defects – Automatic Tissue Processor – Special processing techniques.

- **Microtomes** – Types, Rotary, ultra thin and freezing microtomes.
- **Microtome knives** – Different types, sharpening of microtome knives, care of microtomes and microtome knives – Automated knife sharpening machines – Substitution of blades in place of knives. Knife angles
- **Section cutting** – Procedure , problems during section cutting and their remedies
- **Frozen section** – Principle, different methods of obtaining frozen sections, cryostat, freezing microtome, uses of frozen sections.
- **Staining** – Principles of staining, preparation of different stains, its storage and quality check, mordents, accentuators and accelerators.
 - A) Routine Haematoxylin & Eosin stain – principle, preparation of the stain, quality check, staining procedure, interpretation – Preparation of common haematoxylin – Harri's, O
 - B) Special stains – PAS, Perls, Vangeeson's, Trichrome and Reticulin stains – principle, preparation, procedure, use of control and results
- **Demonstration of the following in the tissues** – methods, principles, reagent preparation and results of – glycogen, mucin, hemosiderin, calcium, fat, melanin, AFB, reticulin, collagen.
- **Introduction to immuno histochemistry**
- **Automation in histopathology**
- **Basic knowledge of museum techniques**
- **Post mortem room technique** – Collection and preservation of tissue, collection of materials for lab studies

3.6.3 Practical- PART II – PAPER III (PATHOLOGY - II)– 150 Hours

1. Histotechnology (90 hrs)

- Preparation and use of reagents for fixation – common fixatives like 10% formalin, formol saline, Zenker's fluid, Carnoy's fluid.
- Tissue processing – fixation, dehydration, clearing, impregnation, embedding, blocking, labelling, trimming of blocks and section cutting.
- Staining – Preparation of common haematoxylin and other reagents used for H&E staining, Routine H&E staining, special stains – preparation, storage of reagents, procedures, use of controls and results for the following special stains – PAS, Perl's, Vangeeson's, Reticulin, AFB

2. Blood banking (60 hrs)

- ABO grouping – forward and reverse- tube and slide

- Antibody titration
- Rh typing – tube and slide
- Coomb's test – direct and indirect
- Cross matching – major and minor

3.6.4 RECOMMENDED BOOKS

1. Medical Laboratory Methods: Dr.RamnicSood
2. Introduction to Medical Laboratory Technology: Baker
3. Cellular Pathology Technique: CFA Culling
4. Theory and practice of Histological Techniques: John.D.Bancroft
5. Clinical Diagnosis and Management of Laboratory Methods: John Bernard Henry

REFERENCE BOOKS

1. Clinical Laboratory Methods and Diagnosis: Gradwohl
2. Diagnostic cytology and its histologic basis vol.I& II: E.G.Koss
3. Hand book of Medical Laboratory Technology: Robert H.Carman
4. Linch's Medical laboratory technology: Raphael
5. Histological Techniques – A practical manual: K.Lakshminarayanan
6. Compendium of transfusion medicine – Dr. R.N. Makroo
7. Technical methods and procedures of the American Association of Blood Banks

4 SCHEME OF TEACHING AND CLINICAL TRAINING

Paper	Subject	Total Hours/subject/year			
		Theory	Practical	Clinical Lab Training	Total Hours
First Year					
Part- I- Paper- I	Biochemistry -I	120	200	160	480
Part- I- Paper II	Medical Microbiology - I	120	200	160	480
Part- I -Paper III	Pathology- I	120	200	160	480
Total		360	600	480	1440
Second year					
Part- II- Paper- I	Biochemistry –II	110	150	220	480
Part- II-Paper-II	Medical Microbiology - II	110	150	220	480
Part- II-Paper-III	Pathology- II	110	150	220	480

Total	330	450	660	1440
Grand Total				2880

- 1.1 Records - compulsory for each subject at the end of the second year and that will be evaluated at the time of concerned Second year Practical Examination.

5 BOOKS / REFERENCE BOOKS PRESCRIBED

5.1 (Part –I Paper-I) BIOCHEMISTRY –I

RECOMMENDED BOOKS

1. An Introduction to medical laboratory y technology - Baker - P Silvertteen.
2. Medical Laboratory Technology - Kanai. L. Mukharjee
3. Medical Laboratory Manual for Tropical Countries Vol-1 Monica Cheesbrough
4. Harper's Biochemistry: R. K. Murray and Grannor
5. Test book of Biochemistry: Vasudevan and Sreekumari
6. Practical – Clinical Biochemistry - Volume 1: Harold Varley

REFERENCE BOOKS

1. Clinical Biochemistry - Principles and Practice: Praful B. Godkar
2. Text book of medical laboratory technology – Ramnik sood
3. Hand book of Medical Laboratory Technology : Robert H. Carman
4. CLINICAL LABORATORY METHODS AND DIAGNOSIS - GRADWAL

5.2 (Part –II Paper-I) BIOCHEMISTRY –II

1. Text book of Biochemistry- DM.Vasudevan and Sree kumari. S
2. Text book of clinical chemistry -Nobert. W. Teitz
3. Practical clinical biochemistry -Harold. Varkey-vol.1 & Vol. II
4. Clinical Biochemistry-Principles & Practice - Praful. B. Godkar

REFERENCE BOOKS

1. Clinical Diagnosis and Management by Laboratory methods – John Bernnard Henry
2. Linch's Medical Laboratory Techniques – Raphel
3. Practical Clinical Biochemistry methods and interpretation- Ranja Chawla 3rd edition

5.3 (Part – I Paper-II) MEDICAL MICROBIOLOGY –I

1. Mackie & Macartney Practical medical Microbiology - Collee. Fraser, Mar mion, Simmons

2. Medical Laboratory Manual for Tropical Countries Vol-1 & Vol - 2 Monica Cheesbrough 2nd Edition
3. Essentials of Medical Microbiology by Apurba S. Sastry , Sandhya Bhat 2nd Edition
4. Microbiology and Parasitology Prep Manual For Undergraduates 3rd Edition by B. S. Nagoba , Asha pichare
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6. Ananthanarayan and Paniker's Textbook of Microbiology by Ananthnarayan ,Paniker , Arti Kapil 9th Edition
7. Paniker's Textbook of Medical Parasitology by Sougata Ghosh 8th Edition
8. Essentials of Medical Parasitology by Apurba S. Sastry ,Sandhya Bhat
9. Medical Parasitology by V. Baveja , C.P. Baveja

5.4 (Part –II Paper-II) MEDICAL MICROBIOLOGY –II

1. Mackie & Macartney Practical medical Microbiology - Collee. Fraser, Mar mion, Simmons
2. Medical Laboratory Manual for Tropical Countries Vol-1 & Vol - 2 Monica Cheesbrough 2nd Edition
3. Essentials of Medical Microbiology by Apurba S. Sastry , Sandhya Bhat 2nd Edition
4. Microbiology and Parasitology Prep Manual For Undergraduates 3rd Edition by B. S. Nagoba , Asha pichare
5. Textbook of Microbiology By Dr. C.P. Baveja
6. Ananthanarayan and Paniker's Textbook of Microbiology by Ananthnarayan ,Paniker , Arti Kapil 9th Edition
7. Textbook of Diagnostic Microbiology 6th Edition by Connie R. Mahon , Donald C. Lehman
8. Bailey and Scott's Diagnostic Microbiology : by Patricia Tille, 14th Edition

5.5 (Part -1 Paper –III) PATHOLOGY – I

1. General Anatomy – Chaurasia
2. Practical Haematology – Dacie& Lewis
3. Medical Laboratory Methods – Dr.RamnicSood
4. Introduction to Medical Laboratory Technology – Baker

REFERENCE BOOKS

1. De Gurchy's Clinical Haematology in Medical Practice – de Gurchy
2. Clinical diagnosis & management by laboratory methods –John Bernard Henry

3. Wintrobe's Clinical Haematology vol I & II
4. Clinical laboratory methods and diagnosis – Gradwohl
5. Handbook of Medical Laboratory Technology – Robert H. Carman
6. Linch's Medical Laboratory Technology – Raphael
7. Exfoliative cytology in Gynaecological practice : Erisa G Wachtel

5.6 (Part -II Paper –III) PATHOLOGY – II

RECOMMENDED BOOKS

1. Medical Laboratory Methods: Dr.RamnicSood
2. Introduction to Medical Laboratory Technology: Baker
3. Cellular Pathology Technique: CFA Culling
4. Theory and practice of Histological Techniques: John.D.Bancroft
5. Clinical Diagnosis and Management of Laboratory Methods: John Bernard Henry

REFERENCE BOOKS

1. Clinical Laboratory Methods and Diagnosis: Gradwohl
2. Diagnostic cytology and its histologic basis vol.I& II: E.G.Koss
3. Hand book of Medical Laboratory Technology: Robert H.Carman
4. Linch's Medical laboratory technology: Raphael
5. Histological Techniques – A practical manual: K.Lakshminarayanan
6. Compendium of transfusion medicine – Dr. R.N. Makroo
7. Technical methods and procedures of the American Association of Blood Banks

6 EXAMINATION

6.1 Scheme of internal assessment –Regular internal assessment through written & practical exam shall be conducted. Minimum of 2 internal assessment & one model exam are to be conducted & average of these marks is to be tabulated and presented to the DME before the final examination.

6.2 Final examination : Shall be conducted at the end of First year and second year

6.2.1 The Authority to conduct the examination:

The Director of Medical Education, Government of Kerala

6.2.2 Frequency

Regular examination shall be conducted at the end of the 1st and 2nd years.

Supplementary examination shall be conducted 6 months after the regular examination.

6.2.3 Eligibility

- a. Minimum of 80% attendance in theory, practical & clinical training and minimum internal sessional mark is required to appear for the final exam.

- b. Certificate of satisfactory completion of the course by the Course Director or Head of Department/Institution.
- c. Partial appearance is permitted in the public examination provided the candidate satisfies above criteria. Such candidates shall not be eligible for the award of Rank.

6.2.4 Schedule of Exam

- a. Regular examination shall be conducted at the end of the academic year. For **first year theory exam only** for second year which includes theory, practical & Viva voce.
- b. Total --6-- Papers (--3-- papers in the 1st year and --3-- papers in the 2nd year)
- c. Each paper shall be of duration of 3 hours with total marks of 100 each. Each paper shall have 2 sections- Section A & Section B.

6.2.5 Scheme of mark distribution in each subject

1. First Year DMLT (Theory Only)

Part Paper	Subject	Theory					
		DME exam		Sessional		Total	
		Max	Min 45%	Max	Min	Max	Min 50%
Part- Paper I	Biochemistry -I	100	45	25		125	63
Part- Paper II	Medical Microbiology - I	100	45	25		125	63
Part- Paper III	Pathology- I	100	45	25		125	63
Total Marks						375	188

2. Second year DMLT (Theory, Practical & Viva voce)

2. Second year DMET (Theory, Practical & Viva voce)																
Part Paper	Subject	Theory						Practical								
		DME exam		Sessional		Total		DME exam		Viva	Sessional		Total		Grand Total	
		Max	Min 45%	Max	Min	Max	Min 50%	Max	Min 40%	Max	Max	Min	Max	Min 50%	Max	Min 50%
Part-I Paper I	Biochemistry –II	100	45	25	-	125	62.5	100	40	25	25	-	150	75	275	138
Part-II Paper II	Medical Microbiology - II	100	45	25	-	125	62.5	100	40	25	25	-	150	75	275	138

Part-II Paper III	Pathology- II	100	45	25	-	125	62.5	100	40	25	25	-	150	75	275	138
Total Marks															825	413

Grand Total Marks – First Year + Second year = 375+825=1200(Max), 600 (Min)

3. Duration of Theory and Practical exams

Year of study	Paper	Subject	Duration of exam		Description
			Theory (Hours)	Practical (Days)	
First Year	Part –I Paper I	Biochemistry –I	3	-	No practical exam for For First year
	Part –I Paper II	Medical Microbiology - I	3	-	
	Part –I Paper III	Pathology- I	3	-	
Second Year	Part –II Paper I	Biochemistry –II	3	2	In case of two batches, Practical exam can be Completed in 3 days (1 st & 2 nd day for first batch and 2 nd & 3 rd day for second batch)
	Part –II Paper II	Medical Microbiology - II	3	3	In case of two batches, Practical exam can be Completed in 4 days (1 st , 2 nd & 3 rd day for first batch and 2 nd , 3 rd & 4 th day for second batch)
	Part –II Paper III	Pathology- II	3	2	In case of two batches, Practical exam can be Completed in 3 days (1 st & 2 nd day for first batch and 2 nd & 3 rd day for second batch)

6.3 EXAMINERS

There shall be two examiners for practical and viva –one internal and one external.

Faculty with post PG teaching experience of minimum of 1 year in the concerned course (MD/MSc MLT)/subject (Biochemistry/Microbiology/Pathology) is eligible to be an examiner or B.Sc MLT and those who are full time teachers of Medical Laboratory Technology with at least three years of full time teaching experience in medical laboratory technology (in the concerned subject) after the acquisition of B.Sc MLT.

6.4 PASS CRITERIA

Minimum of 45% of marks in each theory paper with a minimum of 50% of marks in the total theory paper and a minimum of 40% of marks in the oral/practical exam with a minimum of 50% aggregate marks of the grand total (Total theory, practical and internal assessment) –

First year examination	-	188 out of 375.
Second year examination	-	413 out of 825
Total	-	600 out of 1200

6.5 FIRST CLASS/DISTINCTION/RANK

Candidates scoring not less than 65% & above shall be awarded first class. Candidates scoring 75% & above shall be awarded distinction. Candidates who scores highest mark in the grand total (Theory, practical and internal assessment) the regular examination shall be awarded the first Rank.

Criteria for promotion - A student shall be promoted from the first year of the DMLT course to the second year irrespective of whether he/ she has passed the first year DMLT examinations completely or not. The Candidate shall pass all subjects of the first year of the DMLT course before registering for second year DMLT examination.

6.6 REVALUATION:

Any candidate who requires revaluation shall submit the request to do so within 14 days of the official declaration of results

7 MODEL QUESTION PAPERS

Theory

First Year DMLT Examinations

(Part –I Paper-I) BIOCHEMISTRY –I

Time: 3 Hours

Total Mark: 100

- *Answer all the questions*
- *Draw diagrams where ever necessary*
- *Answer Section A & B in separate answer books*

Section – A

Laboratory principles, Instrumentation including Physiology

1. Write the principle of colorimetry. Describe the parts of a colorimeter with suitable diagram.

(4+6=10)

Write short notes

(4×10=40)

2. Normal solution.
3. 24 hr urine collection.
4. Calibration of pipette.
5. Distilled water.
6. Anticoagulants.
7. Nephron .
8. pH meter.
9. Laboratory hazards
10. SI units.
11. Bile

Section – B

Biological molecules & Estimation

1. Briefly describe the principles of different methods of blood sugar estimation. Write one method in detail.

(4+6=10)

Write short notes

(4×10=40)

2. Biuret reaction.

3. Gout.
4. GTT.
5. Serum electrolytes.
6. Liebermann Burchad reaction.
7. NPN substances in blood.
8. Serum proteins.
9. Triglycerides.
10. Write the normal value of:(a) Serum uric acid(b) Serum phosphorus
(c) A/G ratio (d) Serum chloride
11. CSF protein.

Second Year DMLT Examinations
(Part-II -Paper-I) BIOCHEMISTRY - II

Time: 3 Hours

Total Mark: 100

- *Answer all the questions*
- *Draw diagrams where ever necessary*
- *Answer Section A & B in separate answer books*

Section – A

Diagnostic Biochemistry

1. What are LFT? Briefly describe different tests done in LFT.

(2+8=10)

Write short notes

(4x10=40)

2. Clearance tests .
3. Rotheras test.
4. Bence jones protein.
5. VMA.
6. TFT.
7. BUN.
8. Bile pigments.
9. Urinometer
10. Gastric tubes.
11. GFR.

Section – B

Enzymology, Quality control & Advanced techniques

1. What are different types of transaminases ? Write the procedure of any one method of its estimation.

(2+8=10)

Write short notes

(4x10=40)

2. Agar gel electrophoresis.
3. Quality control serum.
4. POCT.
5. Urine amino gram.
6. RIA.
7. Ion selective electrodes.
8. Dry chemistry analyzers.

9. Co-enzymes.
10. CLIA.
11. Sensitivity and specificity.

DMLT PRACTICAL EXAMINATION
BIOCHEMISTRY
Total Marks – 100

1. Estimate the following in plasma/serum/urine/CSF:

Sugar/urea/creatinine/creatine/ total protein/albumin/Total cholesterol/ phosphorus/ calcium/ bilirubin/ chloride. (25 marks)

2. Estimate the activity of the following enzyme in serum:

Alanine aminotransferase/ aspartate aminotransferase/ alkaline phosphatase/ acid phosphatase/ amylase

OR

Preparation of standard curve and reporting concentration of Sugar in plasma/serum.

(35 marks)

3. Do any two tests marked below in urine

Ninhydrin test/ Cyanid nitroprusside test/ Ferric chloride test/ Benedict's test/ DNPH test

(10 marks)

4. Identify 10 *spotters* and answer the question (20 marks)

5. Certified *record*.(10 marks)

First Year DMLT Examinations
(Part – I Paper-II) MEDICAL MICROBIOLOGY –I

Time: 3 Hours

Total Mark: 100

- *Answer all the questions*
- *Draw diagrams where ever necessary*
- *Answer Section A & B in separate answer books*

Section – A

Basic microbiology & General bacteriology

1. Define of sterilization, disinfection, and antiseptis. Discuss moist heat sterilization in detail.

(3+7=10)

Write short notes

(4x10=40)

2. Robert Koch and postulates.
3. Electron Microscope.
4. Laboratory safety cabinets.
5. Bacterial spores.
6. Negative staining.
7. Bacterial growth curve.
8. Chocolate agar.
9. Gas pack system
10. Colony morphology of bacteria on solid medium.
11. Coagulase test.

Section – B

Immunology & Parasitology

1. Describe life cycle of malarial parasites. Discuss laboratory diagnosis of malaria.

(3+7=10)

Write short notes

(4x10=40)

2. Ig M.
3. ELISA.
4. Live vaccine.
5. Free-living pathogenic amoeba.
6. Leishmania donovani.
7. Trichomonas vaginalis.
8. Dracunculus medinensis.
9. NIH swab.
10. Hydatid cyst.
11. Paragonimus westermani.

Second Year DMLT Examinations
(Part –II Paper-II)MEDICAL MICROBIOLOGY –II

Time: 3 Hours

Total Mark: 100

- *Answer all the questions*
- *Draw diagrams where ever necessary*
- *Answer Section A & B in separate answer books*

Section – A

Systematic & Diagnostic Bacteriology

1. Explain significant bacteriuria. Collection, preservation, transport and processing of Urine specimen for the diagnosis of bacterial urinary tract infections. (2+8=10)

Write short notes

(4x10=40)

2. Bile solubility test
3. Elek's gel precipitation test.
4. Identification of *Vibrio cholera*.
5. Methylene blue reduction test.
6. Petroff's method
7. Satellitism.
8. *Yersinia pestis*.
9. Blood culture media
10. E-test
11. ASO Test

Section – B

Mycology & Virology

1. Morphology of HIV. Discuss laboratory diagnosis of AIDS.

(2+8=10)

Write short notes

(4x10=40)

2. Dermatophytosis.
3. Rhinosporidiosis.
4. Histoplasmosis.
5. Germ tube test.
6. Slide culture for fungi.
7. Lactophenol Cotton Blue (LCB) stain.
8. Hepatitis B virus.
9. Dengue fever.
10. Rabies virus
11. Cell culture in virology.

DMLT PRACTICAL EXAMINATION
MEDICAL MICROBIOLOGY
Total Marks – 100

1. Process the given clinical specimen and make a report with the help of minimum tests within 3 days - including *Antibiotic Sensitivity Test*.
(40Marks)
2. A Sputum smear is providing to you from a patient suspected to be a case of *Pulmonary Tuberculosis*. Do a *differential stain* to confirm the diagnosis and report.
(10Marks)
3. Do a laboratory examination of given *Stool Sample for intestinal parasites* and make a report.
(5Marks)
4. Do a serological investigation for *Enteric fever*.
(10Marks)
5. Do a serological investigation for the Clinical Conditions.
Syphilis or Rheumatic fever or Rheumatoid arthritis.
(5Marks)
6. Identify *10 spotters* and answer the question.
(20Marks)
7. Certified *record*.
(10Marks)

First Year DMLT Examinations
(Part -I Paper –III) PATHOLOGY – I

Time: 3 Hours

Total Mark: 100

- *Answer all the questions*
- *Draw diagrams where ever necessary*
- *Answer Section A & B in separate answer books*

Section – A

Anatomy & Haematology

1. Describe the methods of preparation of bone marrow smears. Enumerate the stains used in staining the smears. Describe the procedure of staining of the bone marrow smears that is following in your haematology laboratory (2+3+5=10)

Write short notes

(4x10=40)

2. Anticoagulants
3. Prothrombin time
4. WBC count
5. Cyanmethaemoglobin method
6. Romanowsky stains
7. Structure of nephron
8. Draw a labelled diagram of human cell
9. Structure of liver
10. Haemophilia
11. Osmotic fragility test

Section – B

Clinical pathology, Cytology & Cytogenetics

1. Discuss the principle, reagent preparation, procedure and interpretation of result of Papanicolaou staining method (2+2+4+2=10)

Write short notes

(4x10=40)

2. Karyotyping
3. Fixatives in cytology
4. Organised sediments in urine
5. Sperm count
6. Barr body
7. Shorr's stain
8. Processing of urine specimen in cytology lab
9. Detection of protein in urine
10. CSF cell count
11. Klinefelter's syndrome

Second Year DMLT Examinations
(Part- II Paper – III) PATHOLOGY – II

Time: 3 Hours

Total Mark: 100

- *Answer all the questions*
- *Draw diagrams where ever necessary*
- *Answer Section A & B in separate answer books*

Section – A
Blood banking

1. Explain different methods of ABO grouping (10 marks)

Write short notes (4x10=40)

2. ICT
3. Du Testing
4. Cryoprecipitate
5. Donor screening
6. Cross matching
7. Lectins
8. Anticoagulants in Bloodbank
9. HDN
10. Tansfusion reactions
11. Apheresis

Section – B
Histotechnology

1. Define Fixation. Classify fixatives used in histopathology lab. Explain formalin fixation (1+3+6=10)

Write short notes (4x10=40)

2. Demonstration of calcium in tissues
3. Cryostat
4. Mountants
5. Acid decalcification
6. Perls staining
7. Microtome knife profile
8. Embedding techniques
9. Removal of formalin pigment from tissues
10. Faults in section cutting
11. Frozen section

DMLT PRACTICAL EXAMINATION

PATHOLOGY

Total marks – 100

1. Perform the count *marked* below (10 marks)
 - a) Total WBC count.
 - b) RBC count.
 - c) Platelet count.
 - d) Reticulocyte count.
 - e) Absolute eosinophil count.
 - f) CSF cell count.
 - g) Sperm count.
2. Make a *blood smear* with standard qualities, stain the smear and perform a **DLC**. (10marks)
3. Find out the *Blood group & Rh type* of the blood sample (tube method) (10 marks)
4. Perform the investigation which is *marked* below (10 marks)
 - a) Hb
 - b) PCV
 - c) ESR
5. Perform any *two tests* of the *urine sample* marked below (10 marks)
 - a) Physical examination
 - b) Bile pigment
 - c) Albumin
 - d) Sugar
 - e) Bile salt
 - f) Urobilinogen
 - g) Acetone
 - h) Blood
 - i) Deposit
6. *Cut the section* from the embedded tissue (10 marks)
7. Stain the given section with *H&E*. (10 marks)
8. Spotters (10 numbers) (20 marks)
9. Certified Record (10 marks)

GOVERNMENT OF KERALA
Directorate of medical education

Sl. No.
Thiruvananthapuram

Date.....

MARK LIST OF DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY
EXAMINATION

Register No.....

Certified that the following marks are awarded to Sri/Smt

..... in the diploma Course in Medical
Laboratory Technology Examination held in

First year

Part- Paper Subject		Marks awarded	Marks awarded (in words)	Minimum Marks for a pass	Maximum Marks
Part-I Paper-I Biochemistry – I Theory	Written			45	100
	Internal Assessment			-	25
	Total			63	125
Part-I Paper-II Medical Microbiology – I Theory	Written			45	100
	Internal Assessment			-	25
	Total			63	125
Part-I Paper-III Pathology-I Theory	Written			45	100
	Internal Assessment			-	25
	Total			63	125
Grand Total				188	375

He / She is declared to have passed the whole / completed / failed in the examination inClass
Classification: 50% - Passed, 65% & above – First class, 75% & above – Distinction.

Entered by:

Checked by:

CHAIRMAN
Board of Examination

GOVERNMENT OF KERALA
Directorate of medical education

Sl. No.

Thiruvananthapuram

Date.....

MARK LIST OF DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY
EXAMINATION

Register No.....

Certified that the following marks are awarded to Sri/Smt

..... in the diploma Course in Medical

Laboratory Technology Examination held in

Second Year

Part- Paper Subject		Marks awarded	Marks awarded (in words)	Minimu m Marks for a pass	Maximum Marks
Part-II Paper-I Biochemistry – II Theory	Written			45	100
	Internal Assessment			-	25
	Viva			-	25
	Total			75	150
	Practical			40	100
	Internal Assessment			-	25
	Total			63	125
	Grand Total			138	275
Part-II Paper-II Medical Microbiology – II Theory	Written			45	100
	Internal Assessment			-	25
	Viva			-	25
	Total			75	150
	Practical			40	100
	Internal Assessment			-	25
	Total			63	125
	Grand Total			138	275
Part-II Paper-III Pathology-II Theory	Written			45	100
	Internal Assessment			-	25
	Total			63	25
	Practical			40	100
	Internal Assessment			-	25
	Total			63	125
	Grand Total			138	275
Grand Total				413	825
First year				188	375
First year + Second year Grand Total				600	1200

He / She is declared to have passed the whole / completed / failed in the examination inClass

Classification: 50% - Passed, 65% & above – First class, 75% & above – Distinction.

Entered by:

Checked by:

CHAIRMAN
Board of Examination

Syllabus of Diploma Courses
Conducted by Directorate of Medical Education,
Medical College PO, Thiruvananthapuram

DIPLOMA IN RADIOLOGICAL TECHNOLOGY (DRT)

Course Code:02

1. COURSE CONTENT

1		
1.1	Title of the course	<u>DIPLOMA IN RADIOLOGICAL TECHNOLOGY (DRT)</u>
1.2	Aim of the course	Radiodiagnosis is a fast-developing branch of medicine and the Radiodiagnosis Department require well trained Radiographers/Medical Imaging Technologists for their efficient functioning with adequate knowledge in radiation safety.
1.3	Objective of the Course	To teach and train students in Radiodiagnosis /Medical Imaging Technology with adequate knowledge in Radiation safety
1.4	Medium of instruction	English
1.5	Duration	The duration of the course shall be 2 years. The course shall be conducted under the department of Radiodiagnosis. There shall be theory classes along with practical training and resident duty during the course. Duration permitted for successful Completion of the course – 4 years
1.6		A pass in the Higher Secondary Examination of the Board of Higher Secondary Education of Kerala or equivalent examinations conducted by any board in India recognized by any of Universities in Kerala with Physics, Chemistry and Biology as optional subjects and a pass with 40% marks in Physics, Chemistry and Biology put together, are eligible. Relaxation of 5% marks will be allowed to SC/ST candidates.
		Indian citizen of Kerala origin is eligible for admission.
		The Candidate should be above the age of 17 years.
1.9	Strength/batch	Not to exceed 20 students per batch
1.10	Reservation	As per existing Government guidelines
1.11	Admission requirement	Selection to the course shall be made by the Director of Medical Education. Selection will be made on merit basis and based on the marks obtained in the qualifying examination. Selection to the management quota in the self-financing institution where the Course is granted and approved by the Government of Kerala, shall be made by the respective management with transparency.
1.12	Subjects of study	
1.12.1	First Year (PART-I)	
	Paper-I	General & Radiation Physics
	Paper-II	Anatomy
	Paper-III	Physiology & Pathology
1.12.2	Second year (PART-II)	
	Paper-I	Physics of Medical Imaging & Radiation Safety in Radiodiagnosis
	Paper-II	Radiography Techniques
	Paper-III	Advanced Medical Imaging Technology

2. DISTRIBUTION OF HOURS

Part-I: Paper-I General & Radiation Physics (Total 150 Hrs.)			Part-I: Paper-II Anatomy- (Total 130 Hrs.)		Part-I: Paper-III Physiology & Pathology-(Total 260 Hrs.)	
A	General Physics	Hrs.	Anatomy	Hrs.	Physiology	Hrs.
1	Basic Mathematics, Units and Dimensions	3	General Anatomy	10	General Physiology	15
2	Magnetism	5	Regional & Imaging Anatomy- Introduction	15	Physiology of CNS	10
3	Electrostatics	5	Central Nervous system	10	Physiology of CVS	10
4	Current Electricity	5	Cardiovascular System	10	Physiology of Respiratory System	10
5	Electromagnetic Induction	5	Skeletal System (Osteology)	20	Physiology of Musculo-skeletal system	15
6	Alternating Current	6			Physiology of Gastro-Intestinal Tract	15
7	Transformers	6			Physiology of Genito-Urinary system	15
8	Measuring Instruments	6			Physiology of Reproductive System	10
9	Electronics	6			Endocrinology	10
10	Modern Physics	6			Physiologic Laboratory	20
11	Electromagnetic Radiation	6				
12	Radioactivity	10				
	TOTAL	75		65		130
B	Radiation Physics		Anatomy		Pathology	
1	Physics of X-Ray Production and Properties	30	Respiratory System	10	Introduction	4
2	Interaction of Radiation with matter	10	Gastro-Intestinal System	10	Cell injury, cell death, Adaptation	10
3	Charge Particle interaction	5	Genito-Urinary system	10	Inflammation and Repair	10
4	Quantities and Units of Radiation	10	Endocrine system	5	Circulatory Disturbances	10
5	Radiation Detection and Measurement	20	Radiographic Anatomy and Laboratory-Details of Demonstration	30	Immunology	8
6					Neoplasia (Including malignancies of bone, lung, brain, FGS, skin)	25
7					Environmental and Nutritional Disorders	8
8					Infections	10
9					Congenital Malformations	6
10					Miscellaneous conditions	6
11					Haematology	10
12					Blood Bank	5
13					Clinical Pathology	8
14					Cytology	10

	TOTAL	75		65		130
	GRAND TOTAL	150		130		260

Part II

	Part-II: Paper-I Physics of Medical Imaging & Radiation Safety in Radiodiagnosis (Total 150 Hrs.)		Part-II: Paper-II Radiography Techniques (Total 150 Hrs.)		Part-II: Paper-III Advanced Medical Imaging Technology (Total 150 Hrs.)	
A	Physics of Medical Imaging	75	Section-A		Section-A	
1	Physics of Radiological Image	20	History of Radiography and Imaging, Care and Ethics in Radiology & Patient care,	10	Digital Radiography	15
2	Fluoroscopy	5	Positioning & Techniques for various projection	5	Mammography Technique	10
3	Dental Radiography	5	Radiographic technique for individual system	40	Ultrasound Equipment	10
4	Digital Imaging	5	Dental Radiography	10	Computed Tomography (CT scan equipment)	40
5	Mammography	5	Trauma Care	4		
6	Computed Tomography	10	Operation Theatre Radiography	4		
7	Magnetic Resonance Imaging	10	Record Keeping in Radiography	2		
8	Ultrasound	5				
9	Nuclear Medicine	5				
10	Digital subtraction Angiography and Xeroradiography	5				
		75		75		75
B	Radiation Safety in Radio diagnosis	75	Section B	75	Section B	
1	Basic Radiation Physics	3	Special Investigations (Conventional Radiography)	55	Magnetic Resonance Imaging	35
2	Interaction of Radiation with matter	3	Paediatric Radiography	10	PACS	10
3	Radiation quantities and Units	4	Digital Radiography and Advances in Medical Imaging	10	DSA-Equipment and Operation	10
4	Biologic Effects of Radiation	10			Interventional Radiology	10
5	Detection and measurements of Radiation & measuring Instruments	5			Nuclear Medicine	10
6	Radiation Hazard Evaluation and Control	15				
7	QA in Diagnostic Radiology	10				
8	Regulatory requirements	5				
9	Radiation safety considerations in Radiodiagnosis	20				
TOTAL		75		75		75

	GRAND TOTAL	150		150		150
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3. DETAILED SYLLABUS

Part I – Paper I

General and Radiation Physics

Section A

General Physics

1. Mathematics: Proportions-Direct and inverse proportions, Inverse Square law, Graphical representation of parameters that obey linear and exponential law Units and Dimensions: Fundamental units, derived Units, Systems of units.
2. Magnetism: Introduction, Magnetic poles, coulombs law, permeability, magnetic field, flux and flux density, magnetic induction, Weber and Tesla, Magnetic Properties, Intensity of magnetization, Types of magnetic materials, ferromagnetic, paramagnetic and diamagnetic, magnetic susceptibility, hysteresis.
3. Electrostatics: Electric charges, coulombs law, dielectric constant, electric field strength, conductors and insulators, electric potential and potential difference, volt, electric capacitance, Farad, capacitors, capacitors in series and parallel, capacitors in DC circuits, capacitors in radiography.
4. Current electricity: Ampere, Resistance, Ohms law, electrical energy, joule and watts, Electrical power, kWh, power losses in cables, Cable resistance and X-ray exposure.
5. Electromagnetic Induction: Magnetic effects due to electric currents, solenoid, Eddy Current, Fleming's left hand rule, electromagnetic relays, self and mutual induction, Faraday's laws, Lenz's law, Henry, electric motors and generators.
6. Alternating currents: Meaning of AC and its advantages over DC, AC generators, peak, RMS, effective and average values of currents and voltages, phase difference, LC Circuit, RC Circuit, LR Circuit, LCR circuit, LCR circuits series and parallel, three phase AC connections, application of star and delta connections in x-ray technology.
7. Transformers: Introduction, Transformer turns ratio, step up, step down and even ratio transformer, efficiency, transformer losses, constant voltage transformer, transformer rating, auto transformer, mains voltage compensation, transformers used in X-ray circuits.
8. Measuring instruments: Introduction, Galvanometer, moving coil galvanometer, voltmeter, ammeters, shunts, conversion of galvanometer to ammeters and voltmeters, multi meters, meters used in X-ray circuits, mains Voltmeter, pre reading KV Meter, mA meter and mAs meter.
9. Electronics: Introduction, Triode and gas filled diodes, Thyatron tubes, Semi-conductors-intrinsic and extrinsic Semi-conductors, N type and P type, PN junction, biasing, Semiconductor diode, Zenor diode, Transistors and their applications(basics only), MOSFET, Rectifiers- half wave and full wave bridge rectifiers, rectifier circuits used in x-ray technology, Introduction to digital electronics- gate circuits, AND, OR, NAND, NOR or NOT gates.
10. Modern physics: Introduction, atoms and molecules, atomic structure, atomic number, mass number, atomic weight, periodic table, Avogadro number, atomic mass unit, mass defect, mass energy equivalence, Electrons- electron shells, binding energy, distribution of orbital electrons, atomic energy levels, Band theory and band structure, ionization and excitation, characteristic and continuous spectrum, LASER, superconductivity, superconducting magnets. Fluorescence, Phosphorescence, Scintillation, Nuclear Physics - nuclear structure. Protons, neutrons, nuclear forces, Isotopes, Isobars, isomers.
11. Electromagnetic radiations: Introduction, nature of electromagnetic radiation, wave length, frequency, energy and their relations, inverse square law, quantum nature, particle nature, electromagnetic spectrum, Examples of electromagnetic radiations and their applications.
12. Radio activity: Introduction, radioactive disintegration, radioactive emission- alpha, beta and gamma emission and their properties, electron capture, internal conversion, Auger electrons, exponential law of

radioactive decay, decay equation, half-life, average life, decay constant, natural radioactive materials, radioactive equilibrium. Artificial radio activity, nuclear reactions, neutron bombardment, proton bombardment, nuclear fission and fusion, nuclear reactor and cyclotrons. Production of artificial isotopes.

Section B

Radiation Physics

1. Physics of X-Ray Production and Properties:

X-Ray Production: Discovery of X rays, Properties of x rays Production of x rays, Thermionic emission, space charge effect, focal spot, fine and broad focus, Line focus principle, tube housing, X-ray collimator, tube cooling,

X-ray tubes: Gas tube, Coolidge's tube, Stationary and Rotating anode tubes, grid-controlled X ray tubes, Specifications of x ray tubes, heel effect, off focus radiation, Diagnostic and Therapy x ray tubes.

X ray generating Circuits -Transformers used in X-ray machine, high tension, filament and auto transformer, Rectifiers, self-rectified, half and full wave rectifiers, single and three phase generators. Filament Circuit, Kilo voltage Circuit, selection of kVp, mA and mAs, constant potential x ray generators, High frequency generators.

Filters, Inherent filtration, added filtration, Heavy metal filters, Beam hardening, HVL, TVL. Exposure timers, hand timer synchronous timer, electronic timer, mA timer, ionization Timer, AEC testing of timers.

Rating of x ray tubes -power rating and thermal rating, rating charts.

X-ray spectrum: Bremsstrahlung, and characteristic X-rays, quantity and quality of x rays, factors affecting quality and quantity, efficiency of X-ray production, effect of KV and target material on x ray spectrum, Duane Hunt theory- Duane Hunt limit, Spatial distribution of X-rays.

2. Interactions of Radiation with Matter - Photon attenuation, X and Gamma ray interactions, coherent scattering, Photo electric effect, Compton effect, Pair production, Photo disintegration, Interaction Cross sections, dependence of Interaction Cross section on energy and atomic number, Relative importance of these interactions in Radiology and Radiotherapy, HVT, TVT, Attenuation coefficients- Linear and mass energy coefficients.

3. Charged particle interactions- LET, Range, Stopping power, Interactions of Electrons, Interactions of heavy Particles, Interaction and proton, Bragg Peak, Interaction of neutron.

4. Radiation Quantities and Units: Activity- Curie, Becquerel, Rutherford, Flux, Fluence, Exposure, Roentgen and C/Kg, Absorbed dose-Gray, rad, KERMA, Equivalent Dose and units, Quality factor, rem, Sievert, Effective Dose, CEMA, Integral dose.

5. Radiation Detection and Measurements: Principles of radiation detection, effects of energy absorption- physical, chemical and biological effects, Types of Detectors and Efficiency, Primary Secondary and Tertiary dosimeters, Gas Filled Detectors, Solid state Detector, Free air ionization chamber, Measurement of exposure, Ionization Chamber, Thimble chamber, Farmer chamber, condenser chamber, chamber sensitivity, correction factors, electrometers, parallel plate chamber, GM counters, Proportional Counters, Scintillation counters, Gamma ray spectrometers, pocket dosimeters, Contamination monitors, Survey meters, Isotope calibrators, Film dosimeters- Radiographic and Radio chromic films, Film Badges, Thermo luminescence Dosimeters, TLD badges, Chemical dosimeters. OSLD, Biological Dosimeters.

3.2 Part I-Paper II

Anatomy

Section: A

1. General Anatomy – Introduction, Cell, Epithelium, Connective tissue, Cartilage, bone, joints, vascular tissue, Lymphatic tissue, Muscular tissue, Nervous tissue, skin.
2. Regional and Imaging Anatomy
3. Central Nervous system – Spinal cord, cerebrum, cerebellum, brainstem, white matter, ventricles, blood supply.
4. Circulatory system – Thoracic wall & thoracic cavity, Pericardium, heart, chambers great vessels from heart, vascular system, lymphatic system.
5. Skeletal system – Upper limb bones, Lower limb bones, vertebral column, sternum, ribs, skull, joints.

Section: B

1. Respiratory system – Nasal cavity, Larynx, Trachea, Bronchial tree, alveoli, Pleura, lungs, blood supply
2. Gastro Intestinal System – Oral cavity, dentures, tongue, Pharynx, Oesophagus, Stomach, small intestine, large intestine, rectum & Anal canal, salivary glands, liver, gall bladder, pancreas, spleen, peritoneum.
3. Genito urinary system – Kidney, Ureter, Bladder, urethrae, male reproductive organs, female reproductive organ.
4. Endocrine system (basics only) – Pituitary gland, thyroid gland, parathyroid, adrenal glands, Pancreas (Islets), Ovaries, Testis
5. Radiographic Anatomy and Laboratory - Details of Demonstration
Radiographic Anatomy of CNS, Demonstration of CNS, Radiographic anatomy of CVS, Demonstration of CVS,
Radiographic Anatomy of RS, Demonstration of RS,
Radiographic Anatomy of Skeletal system, Demonstration of Bones,
Radiographic Anatomy of GIT, Demonstration of GIT,
Radiographic Anatomy of Genitourinary system, demonstration of genitourinary system

Part I-Paper III

Physiology & Pathology

Section A

Physiology

1. General Physiology – Cell Physiology, Transport across cell membrane. Extracellular and intra cellular fluids – relative properties of each, classification, measurement of body fluids. Blood function, composition, properties. Plasma proteins – types, quantity functions. RBC – functions, properties – PCV, ESR, Osmotic fragility. Definition and normal values. RBC Count – normal values, variation. Erythropoiesis – different stages, factors regulating blood indices. Anaemia – definition, classification, WBC – morphology, normal differential counts variations, total count. Normal values, junction. Platelets – normal count, stages in the development of platelets, function – blood coagulation – anticoagulants bleeding time, clotting time. Blood groups – LANDSTEINER'S law, determination of blood group, Rh system, cross matching, Blood transfusion, transfusion reaction – Erythroblastosis Foetalis, Tissue fluid – Lymph formation, circulation. Skin and temperature regulation function of skin.

2. Physiology of CNS- Nervous system – Functional anatomy, physiology of neuron. Synapses, receptors. Spinal cord – structure, ascending and descending tract. Brain –sensory and motor areas cerebral cortex. Functions of cerebellum, brainstem. Reflexes, cranial nerves. EEG, Cerebrospinal fluid. Sensory and motor pathways. Special sense vision – functional anatomy of eye ball – Image formation in eye, near response. Accommodation, near point, far point. Refractive errors, photochemistry of vision. Visual pathway and its lesions- colour vision, ERG. Audition –structure, physiology of hearing deafness, auditory pathway. Taste sensation – reception, pathway basic taste, modalities – olfaction – receptors, pathway, abnormalities, Autonomic nervous system
3. Cardiovascular system: – Functional anatomy of heart and blood properties of cardiac muscle. Conducting system of heart – origin and spread of cardiac impulse. Cardiac cycle definition, phases of cardiac cycle. Heart sounds – causes, character abnormalities, genesis of murmurs. Cardiac output – definition, normal values, valuation factors affecting cardiac output method of measurement, Fick principle, heart rate and its regulation. Blood pressure – definition, normal value, variation determinants of blood pressure – regulation of blood pressure, local and systematic mechanism, both neural, hormonal. ECG – normal ECG pattern. Arterial Pulse – definition, characters of pulse. Regional Circulation: Cutaneous Circulation, coronary, cerebral, pulmonary, renal and splanchnic Circulation.
4. Respiratory system – Define respiration. Physiological anatomy of respiratory system, functions. Mechanism of ventilation. Breath sounds, surfactant, pressure changes during respiratory cycle. Lung volumes and capacities. Alveolar ventilation, Respiratory dead space. Mechanism of gas exchange. Structure of blood gas barrier, factors affecting diffusion across respiratory membrane. Transport of O₂ and CO₂. Regulation of respiration. Hypoxia – definition, chemical features types, Cyanosis, treatment, Artificial Respiration.
5. Muscle and nerve – Distribution of ions in ECF and ICF, resting membrane potential. Action potential. Muscle – comparison between skeletal, cardiac and smooth muscle. Electrical properties of muscle. Neuro-muscular junction and transmission, Mechanical properties, Excitation, Contraction coupling.
6. Gastrointestinal System – Functional anatomy of gastrointestinal tract, enteric nervous system. Saliva – composition, functions, regulation of secretion, Conditioned and unconditioned reflexes. Gastric juice – composition function, regulation phase, peptic ulcer, its management. Pancreatic secretion – composition, regulation of secretion, pancreatic function tests. Liver – composition, functions of bile, regulation of secretion, enterohepatic circulation. Gall bladder – functions, filling and emptying. Small intestinal juice – Composition, functions, movement of GIT –mastication, deglutition, gastric movements, vomiting, movement of small intestine. Secretions of large intestine. Absorption of carbohydrate, protein, fat. Special tests of gastrointestinal function, barium studies.
7. Genitourinary System Renal System – Functional anatomy of kidney, blood supply. Composition of urine. Process involved in urine formation. Glomerular filtration, Definition, factors affecting Glomerular filtration. Tubular function – absorption and secretion. Reabsorption of sodium, glucose, urea, water. Clearance – definition, method of measurement. Formation and concentration of urine-counter current system. Renal function tests Micturition. Dialysis. Renal Disorders. Diuresis, acid-base balance.
8. Reproductive system – Functions of female reproductive organs. Functions of breast. Female sexual cycle. Pregnancy, parturition. Functions of placenta. Functions of male reproductive system. Male fertility. Methods of contraception in males and females.
9. Endocrinology – Endocrine glands in human body, Hormone – definition, mechanism of action. Hypothalamic hormones. Pituitary glands, Hormone function disorders. Thyroid gland –synthesis of hormones, functions disorders. Parathyroid glands- function, disorders. Endocrine Pancreas – Secretion, regulation, Pancreatic Function Tests, Glucose tolerance test. Pineal gland hormones, prostaglandins, G. I hormones, focal hormones.
10. Demonstration of Experiments in Human Physiology – Microscopic examination of blood. Haemoglobin estimation. Estimation of packed cell volume. ESR estimation. Osmotic fragility. RBC

count. WBC count. Determination of blood groups. Bleeding Time. Clotting time, determination of blood pressure, blood indices.

Section B

Pathology

1. Introduction
2. Cell injury, cell death and adaptation- Atrophy, hypertrophy, hyperplasia and metaplasia, Cell injury – types and causes, Necrosis - definition and types with examples, Pigmentation – classification and description with examples Pathological calcification, Gangrene – Types and features
3. Inflammation and repair - Definitions, features and signs, Types – acute and chronic in detail, Exudate and transudate, Wound healing and fracture healing including factors affecting wound healing and complications
4. Circulatory disturbances, Hyperaemia and congestion, Oedema, Thrombosis, Embolism and infarction, Shock
5. Immunology-Hypersensitivity reactions mainly anaphylaxis, Auto immune disease with examples, Amyloidosis, AIDS
6. Neoplasia (Including malignancies of Bone lung brain FGS and skin)-Definition, Benign and malignant tumours, differences, Examples with details, each organ tumour classification, bone, lung, brain, FGS, Skin in detail, Primary vs secondary tumour appearance, Different nomenclature, Hematoma, Cyst, polyp, cystadenoma, teratoma. Basic histological classification, Carcinoma, Squamous cell carcinoma – major sites, Adenocarcinoma – major sites, Sarcomas, Premalignant lesions, Carcinogenesis with emphasis on radiation carcinogenesis, Metastasis - routes, Tumour markers, Paraneoplastic syndromes, Staging and grading of cancer
7. Environmental and nutritional disorders-, Radiation injury, Protein energy malnutrition – Kwashiorkor and marasmus, Vitamin deficiency diseases (Night blindness, Rickets, scurvy and beriberi), Infections, Acute infection
8. Infections - Pyogenic Infections-General clinical features, Common organ vice examples like meningitis, pneumonia, lung abscess, empyema, osteomyelitis in detail, Typhoid, Chronic infections, Granulomatous Tuberculosis, in detail, Syphilis and Leprosy, Fungal infections, Viral
9. Congenital malformations-Major lesions like Agenesis of various organs, Cong adenomatoid malformation, Cysts of kidney, Meckels' diverticulum, cryptorchidism.
10. Miscellaneous conditions -Pleural effusion, Pneumothorax, Calculi of various organs
11. Haematology- Anaemia – classification, iron deficiency anaemia, megaloblastic anaemia, Agranulocytosis, Polycythaemia, leukaemia –acute and Chronic, Lymphoma – Hodgkin's and NHL – an overview, Haemophilia
12. Blood banking – Blood grouping & cross matching
13. Clinical Pathology – Hb, TC, DC, ESR, PCV, Blood smear, thick smear preparation, Urine examination, motion examination, sputum examination, LE cell test.
14. Cytology – Exfoliative cytology, Types, Sample collection, FNAC, Guided & Non guided, Fixative. Preparation and transportation.

Part II- Paper I
Physics of Medical Imaging and
Radiation Safety in Radio Diagnosis

Section A
Physics of Medical imaging

1. Physics of Radiological Image

Primary radiological image: Latent image formation, developing and fixing, processing Chemistry, action of developer, fixer, steps in film processing, automatic processing. X-ray films - Construction, Types of film, double emulsion film, screen film, non-screen film, single coated film, Characteristic of Film- characteristic curve, optical density, contrast, gamma speed, latitude.

Intensifying screen, construction and action, type of screens, intensifying factors, rare earth screens, screen unsharpness.

Grids: Basic Principles, types of grid-linear grids, Moving grid, potter Bucky grids, grid ratio, grid factor, air gap technique.

Image Quality - Resolution, Noise, Geometric Factors, contrast media and contrast in image formation,

Xeroradiography- General principle-photo conduction- xeroradiographic system, Patient exposure.

2. Fluoroscopy: Introduction, Direct vision Fluoroscopy, dark adaptation, limitations, Image intensifier Fluoroscopy- Principles and operation, Modern Fluoroscopic Imaging Systems- Fluoroscopic Equipment, Pulsed fluoroscopy, ABC, Digital Fluoroscopy, Electronic magnification. Performance of Imaging Systems, Contrast, Noise, Sharpness, Artefacts, Remote Fluoroscopic Systems-Vascular and Interventional radiology systems, Fluoroscopic systems used in Cardiology, Neuro-radiology, Portable and mobile Fluoroscopes, Capacitor discharge and high frequency sets, Mobile IITV, C-ARM. Patient Dose in Fluoroscopy

3. Dental Radiography: Dental Radiography units, self-rectified tubes, grid control tubes, dental equipment, cones, filters, factors OPG and cephalo units, tubes, applications.

4. Digital Imaging: Digital Imaging Systems, Digital Image Receptors-Computed Radiography, Charged Couple Devices, Digital Radiography, Artefacts of Digital Images. Digital Imaging Management, PACS, DICOM, Radiology Information System, Image Compression, Image Post processing and analysis.

5. Mammography: Equipment, Mammogram X-ray tube, filters, film screen combination. Magnification Mammography, Digital mammography.

6. Computed Tomography: Physics of Computed Tomography, CT number, Image display, Equipment for CT, Types of CT scanners, CT Generations, Spiral and multi slice CT, CT Imaging Systems- Image reconstruction and Processing, Filtered back projection, Image acquisition, Scanned Projection radio graphs, Axial CT, Helical CT, MDCT, Cardiac CT, CT Fluoroscopy, Artefacts in CT.

7. Magnetic Resonance Imaging (MRI): Basic Physics of MRI, Relaxation Time. MRI Instrumentations and systems, design considerations, Tissue Contrast, Contrast Agents, Screening techniques, Gradient echo imaging, spin echo imaging, Multi-slice imaging, 3D imaging, Inversion Recovery, Image Quality and Artefacts in MRI, Bio safety in MRI.

8. Ultrasound: Physics of Ultrasound, Production of ultrasound waves, interaction of ultrasound waves, Ultrasound systems, Image Display, Doppler Effect-Doppler Scanning principles. Continuous wave Doppler, Pulsed wave Doppler, Electronic focussing and beam steering, three- dimensional and four-dimensional imaging, Quality Assurance in Ultrasound, Bio effects of ultrasound.

9. Nuclear Medicine: Physics of Nuclear Medicine, Isotopes used in Nuclear Medicine- Production and Properties, Biological and Effective half-lives, Radio pharmaceuticals, Uptake studies, Scanners. Nuclear Medicine instrumentation, Gamma camera, Radio Immuno Assay, SPECT, PET. PETCT.

10. Digital subtraction Angiography (DSA): Introduction, principle, Techniques, DSA systems and

patient dose

Section B

Radiation Safety in Radiodiagnosis (as Per AERB guidelines)

1. Basic Radiation Physics: Atomic structure, Nucleus, Atomic number, mass number, Electron Orbit and energy levels, isotopes and isobars, radioactivity, radioactive decay, half-life, Particle radiation, Electromagnetic radiation, Production of X-Rays, Continuous X-Ray Spectrum, Bremsstrahlung radiation, Characteristic X-rays, Filters, Quality of X-rays, Effect of voltage and current on the intensity of X-rays, Properties of X-rays.
2. Interaction of Radiation with matter- Photoelectric effect, Compton Effect, Pair Production, Ionization of matter, Energy absorbed from X-rays, X-rays scattering, X-rays transmission through the medium, linear and mass attenuation coefficient, HVT and TVT, Interaction of charged particle and neutrons with matter.
3. Radiation Quantities and Units: Radioactivity, Flux, Fluence, Kerma, Exposure, Absorbed Dose, Equivalent Dose, Weighting Factors, Effective Dose, Natural Background radiation, Occupational Exposure limits, Dose limits to public.
4. Biological Effects of radiation-The Cell. Effect of ionizing radiation on cell, chromosomal aberration and its application for the biological Dosimetry, Somatic effects and hereditary effects, stochastic and deterministic effects, Acute exposure and chronic exposure, LD_{50/60}
5. Detection and Measurement of radiation & measuring instruments- Ionisation of gases, Fluorescence, and phosphorescence, Effect of photographic emulsion, Ionisation chambers, Proportional counters, G M counters, Scintillation Detectors, Liquid scintillator, Pocket Dosimeters, TL Dosimeters and their uses in personnel monitoring badges. Advantages and disadvantages of various detectors, appropriateness of different types of detectors for different types of radiation measurement.
6. Radiation Hazard evaluation and control (Diagnostic radiology)
Philosophy of Radiation Protection, Effect of Time, Distance and Shielding, Calculation of workload, calculation of weekly dose to the radiation worker and general public, good work practices in diagnostic radiology, Planning consideration for radiology installation including workload, use factor & occupancy factors, effect of different shielding material.
7. QA in Diagnostic Radiology
QA programs for X-ray tubes and generators, screen film radiography, Digital Radiography, CT, Mammogram, Verification of optical and radiation field congruence, Beam alignment, Focal Spot size, Linearity of tube current mA, and Timer, applied potential, HVT and total Tube filter, Contact between film and intensifying screen, Contrast resolution, Grid alignment, Special Techniques like mammography, CT and Digital Radiography.
8. Regulatory requirements
National Regulatory Board, Responsibilities, organization, Safety Standards, Codes and Guides. Responsibilities of Licensees, registrants and employers and Enforcement of Regulatory requirements. Role of technologist in radiology department, Dose limits
9. Radiation safety considerations in diagnostic radiology
Principle of Justification and Optimization, ALARA, Radiation safety consideration in Conventional radiography and Digital radiography, Radiation safety consideration in Mobile radiography, Radiation safety consideration in Mammography, Radiation Safety considerations in Dental Radiography, Radiation safety consideration in Fluoroscopy. Radiation safety consideration in CT.
10. Demonstration
Time, Distance and Shielding, measurement of HVT & TVT.
Familiarization of radiation survey meters and their functional performance check.
Radiological Protection Survey of Diagnostic X-ray installation.
Familiarization with QA equipment and QA tools in diagnostic radiology
Quality Assurance of conventional X-ray equipment
Quality Assurance and radiation protection survey of a CT Scan installation

Demonstration for checking the shielding adequacy of protective accessories (lead apron/mobile protective barriers MPB))

Investigation of reported excessive exposure of TLD, its genuineness and estimation of actual dose received

Part II – Paper II

Radiography Techniques

Section A

1. History of Radiography and Imaging, Care and Ethics & Patient care: in Radiology

Introduction, history of radiography, Ventilation and temperature of X-ray room, Dark rooms, safe light storage shelves, or cabinet loading bench, hangers, solution, tank, Defects occurring in films while processing, Viewing – Illumination and care of viewing boxes, Awareness of cross infection, general hygiene, , special apparatus for children, neck and head injury patient, casualty management, Cautions before radiographic techniques – Patient: Age, subject types and sex, anatomical landmarks – postural variations – respiratory movement, Regional densities, preparation and immobilization of patient- pathological condition-injuries, fractures and dislocations, , positioning, terminology, identification systems.

Medical law and ethics relevant to Radiology, Psychological approach to patient , ethics followed in imaging female patient, organization to avoid delay, waiting and rest rooms, handling of fracture cases, stretcher and bed patient, method of dealing with helpless patient,.

2. Positioning and techniques for various Projections - A Summary of the factors involved Radiography, Introduction to Radiographic techniques, Isocentric and Non Isocentric techniques.

3. Radiographic technique for individual system –

Upper limb –Technique for hand, Wrist, fingers, thumb, scaphoid, carpal bones, carpal tunnel, forearm, elbow joint, humerus, shoulder Corocoid Process, Acromio-clavicular joint, clavicle, sterno-clavicular joint, Glenohumeral joint scapula.

Lower limb – Leg Alignment, -Technique for foot, Subtalar joint, toes, great toe, calcaneum, ankle joint, leg, knee joint, patella, femur, Hip joint, Sacro-iliac joint, upper third of femur.

Vertebral column – Vertebral caves and Vertebral Levels, Atlanto-occipital articulation, cervical vertebra, Cervico-thoracic vertebra, swimmer's view, thoracic vertebra, thoraco-lumbar vertebra, lumbar vertebra, lumbo-sacral vertebra lumbo-sacral articulation, sacrum, coccyx.

Bones of the thorax–techniques for ribs–upper and lower, sternum.

Skull–Cranium, Sellaturcica, optic foramen, Jugular foramina. Temporal bones–Mastoids, petrous bone, Nasal bones, Mandible, Techniques for mandible, Temporo-mandibular joint.

Paranasal sinus - Techniques for frontal – maxillary, ethmoid, sphenoid, Facial bones

Thorax, Pharynx, Larynx and Trachea

Respiratory system and Heart – Technique for trachea, lungs, mediastinum, Sub-

Diaphragmatic conditions – erect and supine chest x ray – projections relative to collapse, Chest, Abdomen, Pelvic Cavity, Acetabulum

4. Dental Radiography: Introduction- – vertical and horizontal positioning abnormalities use of general and dental units – dental request formula identification and handling of films –use of dental film holders. Technique for full mouth, edentulous subjects, children, intra oral and extra oral crowns, occlusal views, localization. Intra-oral radiography, occlusal radiography – extra oral oblique lateral view.

5. Trauma Care — techniques for acute chest, intestinal obstructions – abdominal perforation – vertebral injuries, skull injuries – spine fractures – Thomas splint, Plaster cases etc. Bedside Radiography

6. Operation Theatre Radiography–Theatre Techniques, Techniques of Asepsis- anaesthetic dangers – precautions.

7. Records in Radiography- Register of X-ray examinations, Despatch register, Film accounts, Machine Log book Maintenance.

Section B

1. Special investigations(Conventional Radiography)- Introduction to Contrast Media -Types, Positive, Negative, water soluble,water insoluble, ionic, non-ionic,Structure of Contrast media, Patient Preparation,Route of Administration, Toxicity and Complications in radiography, CT and MRI.
Special Investigation of individual systems-
 - a. GI Tract- Contrast media – Basic principles – Barium Sulphate, Pharynx and oesophagus, – erect and supine posture – – stomach, duodenum, small intestine, colon and rectum, fluoroscope – compression techniques. single and double contrast techniques, enteroclysis
 - b. Urogenital System – IVU– principles – contrast medium – preparation of patient – children – Serial radio-graphs, variation of time intervals depending on suspected pathology, value of compression – precautions and contra indications. Retrograde pyelography (RGP), RGU. MCU. Approximating cysto-urethrogram.
 - c. Hysterosalpingography (H. S. G) – Principles – contrast media, method for injection – reactions – fluoroscopy- technique.
 - d. Sialography – Sialography – contrast medium – method of injection and techniques, Technique following injection of opaque medium.
 - e. Salivary Glands – Demonstration of opaque salivary calculus, techniques for parotid, sub mandibular-sublingual-glands and ducts.
 - f. Liver and spleen – Technique of PTC, SPV. Gall bladder – Technique for oral cholecystography – PTC – preparation of patient – contrast medium. and intravenous cholangiogram, T Tube Cholangiogram
 - g. Nervous system– special care of neurological patient - myelogram Ventricles – Ventriculography, Encephalography
 - h. Bronchography – Lymphatic system – lymphangiography,
 - i. Breast -ductography techniques
 - j. Lacrimal ducts
 - k. Angiography- Principle-contrast media, method of injection, DSA, Venogram
 - l. Fistulogram and Sinusogram
 - m. MMR, Soft issue Radiography.
2. Pediatric Radiography- Introduction to pediatric radiography, Paediatric radiography techniques, safety considerations in pediatric radiography, portable radiography in pediatrics.
3. Digital Radiography and Advances in Medical Imaging. Image investigation techniques.

PART II PAPER III

Advanced Medical Imaging Technology

Section A

1. Digital Radiography – Introduction. history and development, Direct and indirect digital radiography, digital Fluoroscopy system – digitized image-digital subtraction techniques – digital image processing- future equipment developments – clinical application – Digital Image quality – Laser film printers. Image acquisition – Digital Spot Imaging (DSI) – Digital chest radiography – future developments, CR.
2. Mammography Technique -Background, diagnosis and screening. Imaging Techniques, compression, image quality- Interventional accessories – biopsy equipment attachments, Digital Mammography.

3. Ultrasound –Introduction, Terminology- Different types of machines – portable etc. Doppler, Clinical applications. Image display & recording systems-transducers (scanning probes) – types and shapes-choice, care and maintenance – recording devices, Orientation of the image – focus of the beam – sensitivity and gain – artefacts-quality control-acoustic coupling agents,
4. Computed Tomography - Historical information, Technologic considerations, Basic Principles in CT scanning- Radiation Dose, Patient preparation, Paediatric CT, Contrast Media, Filming, Despatch.
Cross Sectional Anatomy related to CT Scanning,
CT Techniques of Brain, Spine, Head and Neck, Chest, Abdomen, Pelvis, Extremities.
Basic Principles of CT contrast Media- Oral, IV, Rectal, Intrathecal. CT Angiogram- Triple Phase CT -Pressure Injectors. CT Myelogram
HRCT- Lung, Temporal Bone, CT Cisternogram. Cardiac CT, CT Perfusion Techniques, CT Enterogram, CT Enteroclysis. Reconstruction Techniques, -VRT, MPR, Virtual Endoscopy, Navigation etc.
CT artefacts and their clinical significance
CT advantages and limitations, Future developments. Dual energy CT- Dual energy CT equipment - Basic principle- clinical applications.

Section B

1. Magnetic Resonance Imaging: Introduction - MRI Historical information, Technologic considerations, Basic Principles in MRI scanning-Patient Preparation, MRI safety-Patient and Technologist, Patient Registration to Machine, Selection of Protocol, Selection of sequences, Contrast, Termination of studies, after care of the patients, Image Reconstruction Techniques, Filming Techniques, Despatch
Sectional Anatomy related to MR Imaging.
MR Techniques of Brain, Spine, Head and Neck, Chest, Abdomen, Pelvis, Extremities, Joints, Breast, Soft Tissues,
Routine sequences and Protocols, ASL
MR angiogram- TOF and Contrast- Venogram, Pressure Injector
Cardiac MR- Different Sequences- Spin echo Gradient Echo, Fast imaging sequences, Fat suppression, Fluid suppression, SWI, Diffusion Imaging -DWI, ADC, DTI, MR spectroscopy techniques and Applications
MR Perfusion Imaging.
Functional Imaging
Artefacts in MR Imaging.
Advantages and Limitations, Future Developments.
2. Picture Archiving and Communication System(PACS): Introduction, Technique of storing retrieving, presenting and sharing images like x-ray, ultrasound, CT scan and MRI. DICOM images PACS, VNAs and RIS PACS Architecture Cloud PACS
3. DSA – Basic Principles and Clinical applications, Equipment and operation, Serial imaging devices-subtraction process, accessories and choice-catheters, guide wires, Interventional Angiography: Accessories and uses e.g.: coils/stents, pressure Injectors: Types, programming, injection protocols and uses. DSA Subtraction process, injection pump, cine camera, optical system, film processing. Interventional Radiology- Practical Interventional radiology in the diseases of the Hepato-biliary, GIT, Urology, Vascular System and other areas, Indications and contraindications, pitfalls and complications, role of radiographer/imaging technologist in interventional procedures , CT guided procedures: Fine needle aspiration cytology, fine needle aspiration biopsy. Fluoroscopy guided procedures: endoscopic retrograde cholangio-pancreatography (ERCP); percutaneous nephrolithotomy; percutaneous nephrostomy; percutaneous trans hepatic biliary drainage, embolisation, liver biopsy, Vascular Intervention Techniques. Radio frequency ablations Procedures.
4. Nuclear Medicine- Basic principle Instrumentation-Gamma camera, SPECT, PET, clinical Applications-newer developmen

4. Scheme of teaching and Clinical Training

First Year: General and Radiation Physics, Anatomy, Physiology & Pathology

Second Year: Physics of Medical Imaging and Radiation Safety, Radiography Techniques,
Advanced Medical Imaging

Note : Clinical posting will include night shifts also

Year	Subject	No of Hrs
First year	A. Theory- Part I	540 hours (Minimum)
	a. General & Radiation Physics	150
	b. Anatomy	130
	c. Physiology & Pathology	260
	B. Practical & Posting	1000 hours (Minimum)
	a. Radiography	500
	b. Radiology Reception & Film despatch	100
	c. Dental Radiography:	150
Second Year	d. X-ray dark rooms	100
	e. General X-ray Procedures	150
	TOTAL	1540
	A Theory- Part II	450 hours
	a. Physics of Medical Imaging and Radiation safety in Radiodiagnosis	150
	b. Radiography Techniques	150
	c. Advanced Medical Imaging Techniques	150
	B. Practical and Posting	1100 hours
	a. DR and CR	150
	b. Radiography	200
	c. CT Scan	300
	d. Mammography	25
	e. Ultra sound	25
	f. DSA	50
	g. MRI	100
	h. Radiation Safety	50
	i. QA in Radiodiagnosis	150
	j. Radiation Physics and safety	
	TOTAL	1550
	TOTAL (First and Second Year)	3190

Records/Log Book

The Practical records shall be maintained & submitted at the end of the course duly certified by the concerned Faculty and HOD

1.5 TEACHING /LEARNING AIDS

5.1 Text Books(Essential)

1. Christensen's Physics of Diagnostic Radiology by Thomas Curry
2. Human Anatomy by B D Chaurasia's
3. Textbook of Anatomy by Dr Sreedevi's
4. Textbook of Physiology, Guyton and Hall

5. Essentials of Medical Physiology by K Sembulingam
6. Basic Pathology by Robbins, Angell and Kumar
7. Anatomy and Physiology for Radiographers - C.A. Warrick
8. Radiographic Imaging-Chesney & Chesney,
9. Care of patient in diagnostic Radiography - Chesney & Chesney.
10. Clarks Positioning in Radiography by Imaging by Stewart Whitley et al
11. Textbook of radiology for residents and technicians by Bhargava S. K
12. Diagnostic Radiography Glenda.J. Bryan (ELBS)
13. Recent advances in Radiology and Medical Imaging" Lodge & Steiner Interventional radiology-Principles and Techniques by J Ring and Mclean
14. Radiation Protection in Hospitals. Richard F.Mould
- Other documents
- 14 AERB safety Codes for Diagnostic Radiology and Nuclear Medicine
- 15 Atomic Energy Act and Radiation Protection Rules, Govt of India.

5.2 Reference books(Optional):

1. Gray's Anatomy by Henry Gray.
2. Radiographic Anatomy – Meschan
3. InderbirSingh's text book of human Histology
4. Gross Anatomy by I B Singh
5. Gross Anatomy by Vishram Singh
6. Dutta's Textbook of Anatomy
7. Basic Anatomy and Physiology for Radiographers by MRE Dean
8. Surface and Radiological Anatomy by A Halim
9. Principles of Physiology, DebasisPramanik
10. Ganong's Review of Medical Physiology
11. Basic Pathology by Robbins, Angell and Kumar
12. *Fundamental Physics of Radiology* W. J. Meredith J. B. Massey
13. Medical Imaging Physics by William R. Hendee, E. Russell Ritenour
14. MRI: The Basics Ray H. Hashemi, Christopher J. Lisanti, William Bradley
15. MRI basic Principles and Applications Nark A brown
1. Diagnostic Imaging by Peter Armstrong
2. Computed Tomography (Approaches Applications and Operations by Ehsabn Samuels Norbert J Pelc
3. MRI from Picture to Proton Donald W. McRobbie
4. Handbook of MRI Technique, Catherine Westbrook
5. MRI in Practice by Catherine Westbrook
6. MRI Hand Book MR Physics Patient Positioning and Protocols by Muhammed, Elmaoğlu
7. Practical approach to Angiography by Irwin. S. Johnsrude
8. Technologists Guide to mammography by Regan
9. Radiology of Anaesthesia and Critical Care by Christine H Murphy
10. Radiology in Dental Practice Herbert Frommer
11. Interventional radiology Principles and Techniques by Wilfrido R Castaneda
12. Hand Book of Interventional Radiographic Procedures by Krishna Kandarpa and John E Aruny
13. Producing quality Radiographs Angelin M Cuilnnan
14. Atlas of Roentgenographic Positioning by Merrill
15. Children's Radiographic techniques by Feshartlefy
16. Special procedures in Radiology by Sagal
17. Synopsis of Radiological Anatomy with CT by Meschan
18. Basic Medical Techniques and patient care for Technologists by Zillam S Torres
19. Advances in Ultrasound techniques and Instrumentation by Peter Well
20. An Atlas of Normal radiographic Anatomy by Isadore Meschan

21. Radioisotopes and Bone by Franklin Mclean
22. Radiographic Examination of the small Intestine-Roentgenographic Techniques by Ross Golden
23. X ray technology by Charly A Jacobi
24. Nuclear Medicine Instrumentation by Jennifer Prekeges
25. Nuclear Medicine Technology Study Guide by AndrzejNoniuszko
26. Radio-biology for the Radiologist by Eric J. Hall, Amato J. Giaccia
27. IAEA Safety Series
28. Treatment planning & dose calculation in radiation oncology GunillaCarlesonBentel
29. Clinical Radiation Oncology Leonard L. Gunderson and, Joel E. Tepper

Models/Charts: As supported and decided by the concerned Faculty.

5 EXAMINATION

Scheme of internal assessment

Regular internal assessment through written & practical exam shall be conducted. Minimum of 3 internal assessment & one model exam are to be conducted & averages of these marks are to be tabulated and presented to the DME before the final examination.

6.2 Final Examination:

6.2.1 The Authority to conduct the examination:

The Director of Medical Education, Government of Kerala

6.2.2. Frequency

Regular examination shall be conducted at the end of the 1st and 2nd years.

Supplementary examination shall be conducted 6 months after the regular examination.

6.2.3 Eligibility for writing examination

- a. Minimum of 80% attendance in theory & practical is required to appear for the final examination with the provision for one time condemnation up to 10% on medical grounds (condonable limit 70%). Authority for condemnation for shortage of attendance shall be vested with Director of Medical Education, Govt of Kerala.
- b. Certificate of satisfactory completion of the course by the Course Director or Head of Department.
- c. A candidate who has not attained 80% attendance and the shortage is beyond the condonable limit he/ she shall not be eligible to continue the course with the same batch of students. He/ She may obtain special sanction (Condemnation of Break of Study) from the Director of Medical Education to study with the junior batch of students.

6.2.4 Schedule of Examination

- a. Regular examination shall be conducted at the end of the academic year which includes theory, practical / Viva voce
- b. Total 6 Papers (3 papers in the 1st year and 3 papers in the 2nd year)
- c. Each paper shall be of duration of 3 hours with total marks of 100 each. Each paper shall have 2 sections- Section A & Section B.

6.2.5 Scheme of examination:

Maximum marks and minimum marks

Paper and Subjects	Theory DME		Practical and viva Practical/Viva		Grand Total	
	Max	Min	max	min	Max	Min
First Year						
Part I Paper I	100	45	50	20	150	75
Part I Paper II	100	45	50	20	150	75
Part I Paper III	100	45	50	20	150	75
Second Year						
Part II Paper I	100	45	50	20	150	75
Part II Paper II	100	45	50	20	150	75
Part II Paper III	100	45	50	20	150	75

Scheme of Practical/Viva voce Examination:

First Year

Part I Paper I

- Identification from Charts and Models on the related subject
- Identification of x ray equipments and Parts
- Viva voce

Part I Paper II

- Identification from Charts and Models on the related subject
- Identification of Bones and related Parts
- Viva voce

Part I Paper III

- Viva Voce only

Second Year

Part II Paper I

- Identification from Charts and Models on the related subject
- Identification of radiation monitors and safety equipments and their use
- Viva voce

Part II Paper II

- X ray taking of various parts
- Discussion on X ray film taken
- General discussion and Viva voce

Part II Paper III

- Taking CT scans of various parts
- discussion of film taken
- MRI –Identification of sequences and MR contrast with films only
- USS, DSA, Mammogram discussion with films only
- General Discussion

6.3 Examiners

There will be one external and one internal examiners for practical and Viva Faculty with post graduate degree and post PG teaching experience of minimum one year in the concerned subject is eligible to be an examiner

6.4 Pass Criteria

Minimum of 45% of marks for theory paper with a minimum of 50% of marks in the total (theory and Practical) in each subject

A minimum of 40% of marks in the oral/practical examination

A minimum of 50% aggregate marks of the grand total (Total theory, practical)

First year examination	225 out of 450.
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Second year examination	225 out of 450
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6.5 First class/Distinction/Rank

Candidates scoring not less than 65% & above shall be awarded first class. Candidates scoring 75% & above shall be awarded distinction. Candidates who scores highest mark in the grand total (Theory, practical and internal assessment) shall be awarded the first Rank. Candidates clearing the examination in supplementary exam will not be awarded rank.

6.6 Revaluation: Any candidate who requires revaluation shall submit the request to do so within 14 days of the official declaration of the result.

7 Model Question paper

MODEL QUESTION PAPERS

**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
D.R.T. EXAMINATION**

Time: 3 hours

Max. Marks: 100

**PART I - PAPER-I
GENERAL AND RADIATION PHYSICS**

(Answer Section A&B separately)

SECTION-A

- I. Explain the following (Marks 5x2=10)
- a) SI-units b) Ohms law
 - c) Henry d) Bridge rectifier
 - e) Eddy Current
- II. Explain the following (Marks 5x4=20)
- a) Half-life. Find the activity of a cobalt 60 source after 8 Years if the present activity is 100 Curie
 - b) Cyclotron
 - c) Working of Moving Coil Galvanometer
 - d) Working of a PN junction diode
 - e) Characteristic and Continuous X Ray
- III. (Marks 2x10=20)
- a. What are transformers and explain the different types of transformers with figure.
 - b. What is rectification? Explain in detail about the different rectifiers used in X-ray circuits?

SECTION-B

- I. Explain the following (Marks 5x3=15)
- a) Space charge effect b) Disadvantages of self-rectification
 - c) Thermo Luminescent Dosimeter d) HVT and TVT
 - e) Bragg curve
- II. Answer the following (Marks 3x5=15)
- a) Why Tungsten is used as target in X-ray tube
 - b) What is Inherent and Added filtration
 - c) Mention any five radiation Quantities and their Units
- III. Describe various interactions of radiation with matter and explain each interaction. (Marks 1x20=20)

**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
D.R.T. EXAMINATION-2019**

Time: 3 hours

Max. Marks: 100

PART I - PAPER-II

Anatomy

Answer all Question, Draw diagrams wherever necessary

SECTION A

1. Enumerate the parts of female reproductive tract. Describe briefly the anatomy of the ovary uterus and fallopian tubes. Mention the radiological investigation of female reproductive tract. (Marks 3+2+2+1+2 =10)
2. Answer briefly on (Marks 10x4 =40)
 - a. Stomach
 - b. Chambers of Heart
 - c. Kidney
 - d. Shoulder joint
 - e. Urinary Bladder
 - f. Femur
 - g. Cartilage
 - h. Lungs
 - i. Ear
 - j. Liver

SECTION B

3. Enumerate the parts of Brain. Describe cerebrum cerebellum and blood supply of brain. Mention radiological investigation of the nervous system (Marks 2+2+2+2+2 =10)
4. Writeshort notes on (Marks 10x4 =40)
 - a. Epithelia
 - b. Connective Tissues
 - c. Neurons
 - d. Pancreas
 - e. Muscular Tissue
 - f. Microscopic structure of Bone
 - g. Humerus
 - h. Synovial Joint
 - i. Gall Bladder
 - j. Pericardium

**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
D.R.T. EXAMINATION-2019**

Time: 3 hours

Max. Marks: 100

PART I - PAPER-III

Section A

PHYSIOLOGY

Max. Marks: 50

- I. Describe the transport of oxygen in blood. Mention the factors affecting Oxy-Haemoglobin Dissociation curve. Add a note on Hypoxia (Marks 5+2+3=10)
- II. **Write short notes on** (Marks 5x5=25)
 - a. Functions of plasma proteins
 - b. Composition and functions of pancreatic juice
 - c. Factors affecting Glomerular filtration rate
 - d. Regulation of blood pressure
 - e. Physiological actions of Thyroid hormones
- III. **Define the following** (Marks 5x2=10)
 - a. Anaemia
 - b. Cardiac output
 - c. Tidal volume
 - d. Resting membrane potential
 - e. Synapse
- IV. **Name the following** (Marks 5x1=5)
 - a. Two granulocytes in blood
 - b. Normal clotting time
 - c. Pacemaker of human heart
 - d. Female sex hormones
 - e. Receptors for vision

**SECTION B
PATHOLOGY**

Max. Marks: 50

- I. Classify bone tumours. Describe clinical features, X-ray findings, macroscopic and microscopic findings of oestrogenic sarcoma. (Marks 3 + 7=10)
- II. **Write short notes on: -**
 - a. Radiation injury
 - b. Necrosis
 - c. Oedema
 - d. Rickets
 - e. ESR(Marks 5 X 5=25)
- III. **Define the following: -**
 - a. Leukaemia
 - b. Hyperplasia
 - c. Neoplasia
 - d. Jaundice
 - e. Tumour markers

(Marks 5 x 2 = 10)

IV. Name the following: -

- a. Two causes of Granulomatous inflammation
- b. Two examples of metaplasia
- c. Two premalignant lesions
- d. Two types of Acute leukaemia
- e. Two cause of MCHC

(Marks 5 X 1=5)

**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
D.R.T. COURSE EXAMINATION
Time: 3 Hrs. Max. Marks: 100**

**PART II - PAPER-I
PHYSICS OF MEDICAL IMAGING AND RADIATION SAFETY
IN RADIODIAGNOSIS
(Answer Section A & B separately)**

SECTION-A

- IV. Explain the following (Marks 5x4=20)
- a. Colour Doppler
 - b. T_1 and T_2 Relaxation Time
 - c. Characteristic Curve of radiographic film
 - d. Image Intensifier
 - e. CT Number
- V. (Marks 3x5=15)
- a) Describe Automatic Film Processor
 - b) Explain MRI
 - c) Explain Fluoroscopy
- VI. Describe the structure of X-Ray film and Film processing (Marks 1x15=15)

SECTION-B

I Define

- a. Filters
- b. Exposure
- c. Deterministic
- d. GM monitors
- e. Optical Density

(Marks 5x3 = 15)

II. Write Notes on

- a. A QA tools in Diagnostic Radiology 3X5 15
- b. B AERB Safety Codes in Diagnostic radiology
- c. D Role of Technologist in Diagnostic Radiology

III

- A. A Discuss various methods for reducing patient exposures in Diagnostic Radiology and Explain Radiation safety consideration in Dental Radiology

(Marks 5+5 = 10)

- B. Explain QA tests in Mammography and DSA

(Marks 5+5 = 10)

**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
D. R. T. COURSE REGULAR EXAMINATION**

Time: 3 hrs. Max. Marks: 100

PART II- PAPER II

RADIOGRAPHY TECHNIQUES

(Answer Section A & B separately and draw diagrams wherever necessary)

Section A

1. Elaborate the Different views for Paranasal sinuses. Describe the techniques in Detail with the positioning, factors and Centering for each (Marks 5+10=15)

2. Write short notes on (Marks 5 x 7 = 35)

- a. Ten-day rule
- b. Radiographic views for Patella
- c. Handling of Fracture cases
- d. Ball catchers view
- e. Ward Radiography
- f. Views for sternum
- g. SI Joint views

SECTION B

1. Draw a simple labelled diagram of the components of the human urinary system.

Describe the indications, patient preparation and filming sequences for an IVU

(Marks 10+5= 15)

2. Write short notes on

(Marks 5x5=25)

- a. Barium swallow
- b. Sialography
- c. Paediatric Radiography
- d. Contrast Media reactions
- e. T tube Cholangiography

3. Explain the following

(Marks 5x2=10)

- a. RFA
- b. NMR
- c. CT number
- d. PACS
- e. PET

**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
D. R. T. COURSE REGULAR EXAMINATION**

Time: 3 Hrs

Max. marks: 100

PART II- PAPER III

**ADVANCED MEDICAL IMAGING TECHNOLOGY
SECTION A**

1 Describe the techniques of Mammography with Patient Preparation, Positioning, views, filming and Radiation Dose (Marks 3x5= 15)

2 Write Short Notes (Marks 6x5= 30)

- a. CR cassettes
- b. Ultrasound transducer
- c. CT Angiography
- d. Digital radiography
- e. Triple phase CT
- f. Low Dose CT

3 Expand the following (Marks 1x 5 = 5)

- a. HRCT,
- b. VRT,
- c. CTPA,
- d. MLO view
- e. CDI

SECTION B

1. Name the Different components of MRI machine; briefly describe MRI safety Precautions for both Patients and Technicians (Marks 5+5+5 =15)

2. Write Short Notes (Marks 7x 5 = 35)

- a. Seldingers' techniques
- b. Radioactivity
- c. Components of PACS
- d. Diffusion Imaging
- e. SPECT
- f. Microwave ablations
- g. MR contrast Agents

Syllabus.
Diploma Courses

Conducted by Directorate of Medical Education,
Medical College PO, Thiruvananthapuram

DIPLOMA IN RADIODIAGNOSIS AND RADIOTHERAPY TECHNOLOGY (DRRT)

Course Code: PMD -03

1. COURSE CONTENTS

1.1	Title of the course	DIPLOMA IN RADIODIAGNOSIS AND RADIOTHERAPY TECHNOLOGY (DRRT)
1.2	Aim of the course	Radiodiagnosis and Radiotherapy are fast developing branches of medicine and these departments require well trained medical imaging technologists /Radiographers/ Radiotherapy technologists for their efficient functioning with adequate knowledge in radiation safety.
1.3	Objective of the Course	To teach and train students in Radiodiagnosis and Radiotherapy technology with adequate knowledge in Radiation safety
1.4	Medium of instruction	English
1.5	Duration	The duration of the course shall be 3 years. There shall be theory classes along with practical training and resident duty during the course. Duration permitted for successful Completion of the course – 6 years
1.6	Academic eligibility	A pass in the Higher Secondary Examination of the Board of Higher Secondary Education of Kerala or equivalent examinations conducted by any board in India recognized by any of Universities in Kerala with Physics, Chemistry and Biology as optional subjects and a pass with 40% marks in Physics, Chemistry and Biology put together, are eligible. Relaxation of 5% marks will be allowed to SC/ST candidates.
1.7	Nationality	Indian citizen of Kerala origin is eligible for admission.
1.8		The Candidate should be above age of 17
1.9	Strength/batch	Not to exceed 30 students per batch
1.10	Reservation	As per existing Government guidelines
1.11	Admission requirement	Selection to the course shall be made by the Director of Medical Education. Selection will be made on merit basis and based on the marks obtained in the qualifying examination. Selection to the management quota in the self-financing institution where the Course is granted and approved by the Government of Kerala, shall be made by the respective management with transparency.
1.12	Subjects of study	
1.12.1	First Year (PART-I)	
	Paper-I	General & Radiation Physics
	Paper-II	Anatomy

	Paper-III	Physiology & Pathology
1.12.2	Second year (PART-II)	
	Paper-I	Physics of Medical Imaging & Radiotherapy
	Paper-II	Radiography Techniques
	Paper-III	Basics of Radiotherapy
1.12.3	Third year (PART-III)	
	Paper-I	Radiation Safety in Radiodiagnosis & Radiotherapy
	Paper-II	Advanced Medical Imaging Technology
	Paper-III	Advanced Radiotherapy

2. DISTRIBUTION OF HOURS

	Part-I: Paper-I General & Radiation Physics 150 Hrs.		Part-I: Paper-II Anatomy-130 Hrs		Part-I: Paper-III Physiology & Pathology 260 Hrs	
A	General Physics	Hrs	Anatomy	Hrs	Physiology	Hrs
1	Mathematics, Units and Dimensions	3	General Anatomy	10	General Physiology	15
2	Magnetism	5	Regional & Imaging Anatomy- Introduction	15	Physiology of CNS	10
3	Electrostatics	5	Central Nervous system	10	Physiology of CVS	10
4	Current Electricity	5	Cardiovascular System	10	Physiology of Respiratory System	10
5	Electromagnetic Induction	5	Skeletal System (Osteology)	20	Physiology of Musculo-skeletal system	15
6	Alternating Current	6			Physiology of Gastro-Intestinal Tract	15
7	Transformers	6			Physiology of Genito-Urinary system	15
8	Measuring Instruments	6			Physiology of Reproductive System	10
9	Electronics	6			Endocrinology	10
10	Modern Physics	12			Physiologic Laboratory	20
11	Electromagnetic Radiation	6				
12	Radioactivity	10				
	TOTAL	75		65		130
B	Radiation Physics		Anatomy		Pathology	
1	X-Ray Production	15	Respiratory System	10	Introduction	4
2	X-ray Generator Circuits	15	Gastro-Intestinal System	10	Cell injury, cell death, Adaptation	10

3	X- ray spectrum	10	Genito-Urinary system	10	Inflammation and Repair	10
4	Interaction of Radiation with matter	10	Endocrine system	5	Circulatory Disturbances	10
5	Charge Particle interaction	5	Radiographic Anatomy and Laboratory-Details of Demonstration	30	Immunology	8
6	Quantities and Units of Radiation	5			Neoplasia (Including malignancies of bone, lung, brain, FGS, skin)	25
7	Radiation Detection and Measurements	15			Environmental and Nutritional Disorders	8
8					Infections	10
9					Congenital Malformations	6
10					Miscellaneous conditions	6
11					Haematology	10
12					Blood Bank	5
13					Clinical Pathology	8
14					Cytology	10
	TOTAL	75		65		130
	GRAND TOTAL	150		130		260

	Part-II: Paper-I Physics of Medical Imaging & Radiotherapy-150		Part-II: Paper-II Radiography Techniques 150		Part-II: Paper-III Basics of Radiotherapy-150	
A	Physics of Medical Imaging					
1	Radiological Image formation	10	History of Radiography and Imaging, Care and Ethics in Radiology & Patient care,	10	Ethics, Epidemiology and Prevention of cancer	5
2	Physics of Fluoroscopy	8	Positioning and techniques for various Projections	45	Oncopathology	10
3	Dental Radiography	5	Dental radiography	7	Cancers of various sites	40
4	Digital Imaging	8	Trauma Care	5	Methods of Cancer Management	10
5	Mammography	6	Operation Theatre	5	Radio biological	10

			radiography		basis of Radiotherapy	
6	Computed Tomography	10	Record keeping in radiology	3		
7	Magnetic Resonance Imaging physics	10				
8	Physics of Ultrasound	5				
9	Nuclear Medicine	8				
10	Xero radiography and Digital subtraction Angiography	5				
	Total	75		75		75
B	Physics of Radiotherapy		Section B		Section B	
1	Clinical radiation generators.	4	Special investigations (Conventional Radiography)	55	Treatment planning	15
2	Teletherapy Machines	8	Paediatric Radiography	10	Radiotherapy Techniques for various tumours	35
3	Linear Accelerator	8	Digital Radiography and Advances in Medical Imaging	10	Brachytherapy Techniques	10
4	Dose distribution and scatter analysis	10			Modern radiotherapy (introduction only) and Nuclear medicine	15
5	Imaging Modalities and networking systems in radiotherapy	6				
6	Patient positioning Simulation and Mould Room Techniques	10				
7	Electron Beam therapy	4				
8	Brachytherapy	10				
9	Modern Radiotherapy Techniques	15				
	TOTAL	75		75		75
	GRAND TOTAL	150		150		150
	Part-III: Paper-I Radiation Safety in Radiodiagnosis & Radiotherapy 150 hrs		Part-III: Paper-II Advanced Medical Imaging Techniques- 150hrs		Part-III: Paper-III Advanced Radiotherapy 150hrs	

A	Radiation Safety in Radiodiagnosis	Hrs		Hrs		Hrs
1	Basic Radiation Physics	2	Digital Radiography – CR, DR	15	Introduction	4
2	Interaction of radiation with matter,	3	Mammography Technique	10	Prevention and early detection	3
3	Radiation quantities and units.	3	Ultrasound equipment	10	Tumour Biology	15
4	Biologic Effects of Radiation	4	Computed Tomography (CT scan equipments)	40	Tissue structure and radiation effects and Fractionation	15
5	Detection and measurements of radiation.	3			Application of radiation in benign condition	3
6	Radiation Hazard evaluation and control in Diagnostic radiology.	10			Principles of positioning and immobilization	5
7	QA in Diagnostic Radiology	10			Image acquisition and verification	5
8	Regulatory Requirements	10			Patient setup	5
9	Radiation safety considerations in diagnosis radiology and dose indexes	10			Simulation procedures of various cancers	10
10	Demonstration and practical	20				
11	Total	75	total	75		75
B	Radiation safety in Radiotherapy.		Section B		Section B	
1	Radiation Hazard Evaluation and Control(radiotherapy)	10	MRI Equipment – structure and operation	35	Clinical Radiation Oncology of various sites	40
2	Basic radiation therapy physics.	10	PACS	10	Recent Advances in radiotherapy	10
3	QA in Radiotherapy	10	DSA – equipment and operation	10	Brachytherapy	20
4	Radiation Emergency Preparedness	10	Interventional Radiology	10	Duties and Responsibilities	5
5	Regulatory Requirements	10	Nuclear Medicine	10		
6	Demonstration and practical	20				
	Total	75	Total	75	Total	75
20	GRAND TOTAL	150		150		150

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DETAILED SYLLABUS

Part I – Paper I

General and Radiation Physics

Section A General Physics

1. Mathematics: Proportions-Direct and inverse proportions, Inverse Square law, Graphical representation of parameters that obey linear and exponential law, Units and dimensions: fundamental units, derived Units, Systems of units.
2. Magnetism: Introduction, Magnetic poles, coulombs law, permeability, magnetic field, flux and flux density, magnetic induction, Webber and Tesla, Magnetic Properties, Intensity of magnetization, Types of magnetic materials, ferromagnetic, paramagnetic and diamagnetic, magnetic susceptibility, hysteresis.
3. Electrostatics: Electric charges, coulombs law, dielectric constant, electric field strength, conductors and insulators, electric potential and potential difference, volt, electric capacitance, Farad, capacitors, capacitors in series and parallel, capacitors in DC circuits, capacitors in radiography.
4. Current electricity: Ampere, Resistance, Ohms law, electrical energy, joule and watts, Electrical power, kWh, power losses in cables, Cable resistance and X-ray exposure.
5. Electromagnetic Induction: Magnetic effects due to electric currents, solenoid, Eddy Current, Fleming's left hand rule, electromagnetic relays, self and mutual induction, Faraday's laws, Lenz's law, Henry, electric motors and generators.
6. Alternating currents: Meaning of AC and its advantages over DC, AC generators, peak, RMS, effective and average values of currents and voltages, phase difference, LC Circuit, RC Circuit, LR Circuit, LCR circuit, LCR circuits series and parallel, three phase AC connections, application of star and delta connections in x-ray technology.
7. Transformers: Introduction, Transformer turns ratio, step up, step down and even ratio transformer, efficiency, transformer losses, constant voltage transformer, transformer rating, auto transformer, mains voltage compensation, transformers used in X-ray circuits.
8. Measuring instruments: Introduction, Galvanometer, moving coil galvanometer, voltmeter, ammeters, shunts, conversion of galvanometer to ammeters and voltmeters, multi meters, meters used in X-ray circuits, mains Voltmeter, pre reading KV Meter, mA meter and mAs meter.
9. Electronics: Introduction, Triode and gas filled diodes, Thyatron tubes, Semi-conductors- intrinsic and extrinsic Semi-conductors, N type and P type, PN junction, biasing, Semiconductor diode, Zenor diode, Transistors and their applications(basics only), MOSFET, Rectifiers- half wave and full wave bridge rectifiers, rectifier circuits used in x ray technology. Introduction to digital electronics- gate circuits, AND, OR, NAND, NOR or NOT gates.
10. Modern physics: Introduction, atoms and molecules, atomic structure, atomic number, mass number, atomic weight, periodic table, Avogadro number, atomic mass unit, mass defect, mass energy equivalence, Electrons- electron shells, binding energy, distribution of orbital electrons, atomic energy levels. Band theory and band structure, ionization and excitation, characteristic and continuous spectrum. LASER, superconductivity, superconducting magnets. Fluorescence, Phosphorescence, Scintillation, Nuclear Physics - nuclear structure, Protons, neutrons, nuclear forces, Isotopes, Isobars, isomers.
11. Electromagnetic radiations: Introduction, nature of electromagnetic radiation, wave length, frequency, energy and their relations, inverse square law, quantum nature, particle nature, electromagnetic spectrum, Examples of electromagnetic radiations and their applications.

12. Radio activity: Introduction, radioactive disintegration, radioactive emission- alpha, beta and gamma emission and their properties, electron capture, internal conversion, auger electrons. exponential law of radioactive decay, decay equation, half-life, average life, decay constant, natural radioactive materials, radioactive equilibrium. Artificial radio activity; nuclear reactions, neutron bombardment, proton bombardment, nuclear fission and fusion, nuclear reactor and cyclotrons. Production of artificial isotopes.

Section B

Radiation Physics

1. X-Ray Production: Introduction, discovery of X rays, production and properties of x rays- thermionic emission, space charge effect, Interaction of electrons with tube target, process of x ray generation, anode, cathode, focal spot, fine and broad focus, Line focus principle.
X-ray tubes: Introduction, different types of x ray tubes, -gas tube, Coolidge's tube, stationary and rotating anode tubes, grid-controlled X ray tubes, specifications of x ray tubes, anode heel effect, off focus radiation, diagnostic and therapy x ray tubes, tube housing, aperture diaphragms, collimators, cones and cylinders, testing of light beam and x ray beam alignment, functions of beam restrictors, tube shielding and high voltage cables, tube cooling, defects in x ray tubes.
2. X Ray generator circuits: Introduction, transformers used in X-ray machine, high tension, filament and auto transformer, Rectifiers, self-rectified, half and full wave rectifiers, single and three phase generators, Filament Circuit, Kilo voltage Circuit, selection of kVp, mA and mAs, constant potential x ray generators, High frequency generators. Exposure switching- primary and secondary switching, Exposure timers, hand timer, synchronous timer, electronic timer, mA timer, ionization Timer, AEC, testing of timers. Rating of x ray tubes -power rating and thermal rating, rating charts.
3. X-ray spectrum: Introduction, bremsstrahlung and characteristic x-rays, Intensity of x ray beam, factors affecting quality and quantity, efficiency of X-ray production, effect of KV and target material on x ray spectrum, Duane Hunt theory- Duane Hunt limit, Spatial distribution of X-rays.
Filters- Introduction, Inherent filtration, added filtration, filter thickness, effect of filters on patient exposure, effect of filters on exposure factors, wedge filters heavy metal filters, molybdenum filters, beam hardening, HVL, TVT.
- 4 Interactions of Radiation with Matter: Introduction, x and gamma ray interactions, coherent scattering, Photo electric effect, Compton effect, Pair production, photo disintegration, attenuation, attenuation coefficients and Cross sections, Linear and mass attenuation coefficients, factors affecting attenuation coefficients. Relative importance of interactions in diagnostic radiology and radiotherapy, HVT, TVT, scatter radiations- factors affecting scatter radiation.
- 5 Charged particle interactions: LET, range, stopping power, interactions of electrons, interactions of heavy Particles, interaction of proton, Bragg Peak, Interaction of neutron.
- 6 Radiations quantities and units: Introduction, Activity- curie, becquerel, Rutherford, Flux, Fluence, Exposure- Roentgen and C/Kg, Absorbed dose- gray, rad, KERMA, Equivalent Dose -quality factor, rem, Sievert, Effective Dose, CEMA, Integral dose.
- 7 Radiation Detection and Measurements: Introduction, Principles of radiation detection, effects of energy absorption- physical, chemical and biological effects, Types of detectors and

efficiency, primarysecondary and tertiary dosimeters, Gas filled detectors, Solid state detector, free air ionization chamber, measurement of exposure, Ionization chamber, Thimble chamber, Farmer chamber, condenser chamber, chamber sensitivity, correction factors, electrometer, parallel plate chamber, GM counters, Proportional Counters, Scintillation counters, Gamma ray spectrometers, pocket dosimeters, Contamination monitors, Survey meters, Isotope calibrators, film dosimeters- radiographic and radio chromic films, Film Badges, Thermoluminescence dosimeters, TLD badges, Chemical dosimeters. OSLD, Biological Dosimeters.

3.2 Part I-Paper II

Anatomy

Section: A

1. General Anatomy – Introduction, Cell, Epithelium, Connective tissue, Cartilage, bone, joints, vascular tissue, Lymphatic tissue, Muscular tissue, Nervous tissue, skin.
2. Regional and Imaging Anatomy
3. Central Nervous system – Spinal cord, cerebrum, cerebellum, brainstem, white matter, ventricles, blood supply.
4. Circulatory system – Thoracic wall & thoracic cavity, Pericardium, heart, chambers great vessels from heart, vascular system, lymphatic system.
5. Skeletal system – Upper limb bones, Lower limb bones, vertebral column, sternum, ribs, skull, joints.

Section: B

1. Respiratory system – Nasal cavity, Larynx, Trachea, Bronchial tree, alveoli, Pleura, lungs, blood supply
2. Gastro Intestinal System – Oral cavity, dentures, tongue, Pharynx, Oesophagus, Stomach, small intestine, large intestine, rectum & Anal canal, salivary glands, liver, gall bladder, pancreas, spleen, peritoneum.
3. Genito urinary system – Kidney, Ureter, Bladder, urethrae, male reproductive organs, female reproductive organ.
4. Endocrine system (basics only) – Pituitary gland, thyroid gland, parathyroid, adrenal glands, Pancreas (Islets), Ovaries, Testis
5. Radiographic Anatomy and Laboratory - Details of Demonstration
 Radiographic Anatomy of CNS, Demonstration of CNS, Radiographic anatomy of CVS, Demonstration of CVS,
 Radiographic Anatomy of RS, Demonstration of RS,
 Radiographic Anatomy of Skeletal system, Demonstration of Bones,
 Radiographic Anatomy of GIT, Demonstration of GIT,
 Radiographic Anatomy of Genitourinary system, demonstration of genitourinary system

Part I-Paper III
Physiology & Pathology

Section A
Physiology

1. General Physiology – Cell Physiology, Transport across cell membrane. Extracellular and intra cellular fluids – relative properties of each, classification, measurement of body fluids. Blood function, composition, properties. Plasma proteins – types, quantity functions. RBC – functions, properties – PCV, ESR, Osmotic fragility. Definition and normal values. RBC Count – normal values, variation. Erythropoiesis – different stages, factors regulating blood indices. Anaemia – definition, classification, WBC – morphology, normal differential counts variations, total count. Normal values, junction. Platelets – normal count, stages in the development of platelets, function – blood coagulation – anticoagulants bleeding time, clotting time. Blood groups – LANDSTEINER'S law, determination of blood group, Rh system, cross matching, Blood transfusion, transfusion reaction – Erythroblastosis Foetalis, Tissue fluid – Lymph formation, circulation. Skin and temperature regulation function of skin.
2. Physiology of CNS- Nervous system – Functional anatomy, physiology of neuron. Synapses, receptors. Spinal cord – structure, ascending and descending tract. Brain – sensory and motor areas cerebral cortex. Functions of cerebellum, brainstem. Reflexes, cranial nerves. EEG, Cerebrospinal fluid. Sensory and motor pathways. Special sense vision – functional anatomy of eye ball – Image formation in eye, near response. Accommodation, near point, far point. Refractive errors, photochemistry of vision. Visual pathway and its lesions- colour vision, ERG. Audition – structure, physiology of hearing deafness, auditory pathway. Taste sensation – reception, pathway basic taste, modalities – olfaction – receptors, pathway, abnormalities, Autonomic nervous system
3. Cardiovascular system: – Functional anatomy of heart and blood properties of cardiac muscle. Conducting system of heart – origin and spread of cardiac impulse. Cardiac cycle definition, phases of cardiac cycle. Heart sounds – causes, character abnormalities, genesis of murmurs. Cardiac output – definition, normal values, valuation factors affecting cardiac output method of measurement, Fick principle, heart rate and its regulation. Blood pressure – definition, normal value, variation determinants of blood pressure – regulation of blood pressure, local and systematic mechanism, both neural, hormonal. ECG – normal ECG pattern. Arterial Pulse – definition, characters of pulse. Regional Circulation: Cutaneous Circulation, coronary, cerebral, pulmonary, renal and splanchnic Circulation.
4. Respiratory system – Define respiration. Physiological anatomy of respiratory system, functions. Mechanism of ventilation. Breath sounds, surfactant, pressure changes during respiratory cycle. Lung volumes and capacities. Alveolar ventilation, Respiratory dead space. Mechanism of gas exchange. Structure of blood gas barrier, factors affecting diffusion across respiratory membrane. Transport of O₂ and CO₂. Regulation of respiration. Hypoxia – definition, chemical features types, Cyanosis, treatment, Artificial Respiration.
5. Muscle and nerve – Distribution of ions in ECF and ICF, resting membrane potential. Action potential. Muscle – comparison between skeletal, cardiac and smooth muscle. Electrical

properties of muscle. Neuro-muscular junction and transmission, Mechanical properties, Excitation, Contraction coupling.

6. Gastrointestinal System – Functional anatomy of gastrointestinal tract, enteric nervous system. Saliva – composition, functions, regulation of secretion, Conditioned and unconditioned reflexes. Gastric juice – composition function, regulation phase, peptic ulcer, its management. Pancreatic secretion – composition, regulation of secretion, pancreatic function tests. Liver – composition, functions of bile, regulation of secretion, enterohepatic circulation. Gall bladder – functions, filling and emptying. Small intestinal juice – Composition, functions, movement of GIT –mastication, deglutition, gastric movements, vomiting, movement of small intestine. Secretions of large intestine. Absorption of carbohydrate, protein, fat. Special tests of gastrointestinal function, barium studies.
7. Genitourinary System Renal System – Functional anatomy of kidney, blood supply. Composition of urine. Process involved in urine formation. Glomerular filtration, Definition, factors affecting Glomerular filtration. Tubular function – absorption and secretion. Reabsorption of sodium, glucose, urea, water. Clearance – definition, method of measurement. Formation and concentration of urine-counter current system. Renal function tests Micturition. Dialysis. Renal Disorders. Diuresis, acid-base balance.
8. Reproductive system – Functions of female reproductive organs. Functions of breast. Female sexual cycle. Pregnancy, parturition. Functions of placenta. Functions of male reproductive system. Male fertility. Methods of contraception in males and females.
9. Endocrinology – Endocrine glands in human body, Hormone – definition, mechanism of action. Hypothalamic hormones. Pituitary glands, Hormone function disorders. Thyroid gland –synthesis of hormones, functions disorders. Parathyroid glands- function, disorders. Endocrine Pancreas – Secretion, regulation, Pancreatic Function Tests, Glucose tolerance test. Pineal gland hormones, prostaglandins, G. I hormones, focal hormones.
10. Physiological Laboratory- Demonstration of Experiments in Human Physiology – Microscopic examination of blood. Haemoglobin estimation. Estimation of packed cell volume. ESR estimation. Osmotic fragility. RBC count. WBC count. Determination of blood groups. Bleeding Time. Clotting time, determination of blood pressure, blood indices.

Section B

Pathology

1. Introduction
2. Cell injury, cell death and adaptation- Atrophy, hypertrophy, hyperplasia and metaplasia, Cell injury – types and causes, Necrosis - definition and types with examples, Pigmentation – classification and description with examples Pathological calcification, Gangrene – Types and features
3. Inflammation and repair - Definitions, features and signs. Types – acute and chronic in detail, Exudate and transudate, Wound healing and fracture healing including factors affecting wound healing and complications
4. Circulatory disturbances, Hyperaemia and congestion, Oedema, Thrombosis, Embolism and infarction, Shock

5. Immunology-Hypersensitivity reactions mainly anaphylaxis, Auto immune disease with examples, Amyloidosis, AIDS
6. Neoplasia (Including malignancies of Bone lung brain FGS and skin)-Definition, Benign and malignant tumours, differences, Examples with details, each organ tumour classification, bone, lung, brain, FGS, Skin in detail, Primary vs secondary tumour appearance, Different nomenclature, Hematoma, Cyst, polyp, cystadenoma, teratoma. Basic histological classification, Carcinoma, Squamous cell carcinoma – major sites, Adenocarcinoma – major sites, Sarcomas, Premalignant lesions, Carcinogenesis with emphasis on radiation carcinogenesis, Metastasis - routes, Tumour markers, Paraneoplastic syndromes, Staging and grading of cancer
7. Environmental and nutritional disorders-, Radiation injury, Protein energy malnutrition – Kwashiorkor and marasmus, Vitamin deficiency diseases (Night blindness, Rickets, scurvy and beriberi), Infections, Acute infection
8. Infections - Pyogenic Infections-General clinical features, Common organ vice examples like meningitis, pneumonia, lung abscess, empyema, osteomyelitis in detail, Typhoid, Chronic infections, Granulomatous Tuberculosis, in detail, Syphilis and Leprosy, Fungal infections, Viral
9. Congenital malformations-Major lesions like Agenesis of various organs, Cong adenomatoid malformation, Cysts of kidney, Meckels' diverticulum, cryptorchidism.
10. Miscellaneous conditions -Pleural effusion, Pneumothorax, Calculi of various organs
11. Haematology- Anaemia – classification, iron deficiency anaemia, megaloblastic anaemia, Agranulocytosis, Polycythaemia, leukaemia –acute and Chronic, Lymphoma – Hodgkin's and NHL – an overview, Haemophilia
12. Blood banking – Blood grouping & cross matching
13. Clinical Pathology – Hb, TC, DC, ESR, PCV, Blood smear, thick smear preparation, Urine examination, motion examination, sputum examination, LE cell test.
14. Cytology – Exfoliative cytology, Types, Sample collection, FNAC, Guided & Non guided, Fixative. Preparation and transportation.

Part II- Paper I
Physics of Medical Imaging and Radiotherapy
Section A. Physics of Medical imaging

1. Radiological image formation:X-ray films-Construction.Emulsion.Types of film, double emulsion film, screen film, non-screen film, single coated film, Latent image,formation. Film processing- film development, developing solutions, replenishment,fixing fixing agents, processing chemistry, action of developer, fixer, steps in film processing, automatic processing.Characteristic of Film- characteristic curve, optical density, contrast, gamma speed, latitude.
 Intensifying screen- Introduction, construction and action, type of screens, intensifying factors, rare earth screens,resolving power,phosphor technology,emission spectra,quantum mottle, screenunharness.
 Grids- Introduction- basicprinciples, terminology-grid ratio, grid factor, grid pattern, types of grid-linear grids, moving grid, Potter Bucky grids,Lines per inch, Bucky factor, grid cut off, grid selection, air gap techniques:
 Image Quality –Introduction, resolution, noise, line spread functions. Geometry of Image-

Magnification, true and geometric magnification, distortion, penumbra, unsharpness, contrast, contrast media.

2. Physics of Fluoroscopy: Introduction, Direct vision fluoroscopy, dark adaptation, limitations, Image intensifier-Principles and operation, Imaging characteristics-contrast, lag, distortion, viewing and recording of images. Capacitor discharge and high frequency sets, Mobile IITV, C-ARM

Modern Fluoroscopic Imaging Systems- Fluoroscopic Equipment, Pulsed fluoroscopy, AEC, Digital Fluoroscopy, Electronic magnification. Performance of Imaging Systems, Contrast, Noise, Sharpness, Artefacts

Application specific fluoroscopic systems- Remote Fluoroscopic Systems, Vascular and Interventional radiology systems, Fluoroscopic systems used in Cardiology, Neuro-radiology, Portable and mobile Fluoroscopes, spot film devices, Patient Dose in Fluoroscopy

3. Dental Radiography: Dental Radiography units, self-rectified tubes, grid control tubes, dental equipment, cones, filters, factors OPG and cephalo units, tubes, applications.

4. Digital Imaging: Introduction, Image encoding and display, Digital Imaging Systems, Digital Image Receptors-Computed Radiography, Charged Couple Devices, Digital Radiography, Artefacts of Digital Images.

Digital Imaging Management- PACS, DICOM, Radiology Information System, Image Compression, Image Post processing and analysis- spatial filtering, noise removal, edge ridge and shape detection, Quality management-QMS, QA, QC, Quality standards and good practice, networking, image compression,

5. Mammography: Equipment, Mammogram X-ray tube, filters, film screen combinations. Magnification Mammography, Digital mammography.

6. Computed Tomography: Introduction, Physics of Computed Tomography, Hounsfield units, CT number, CT imaging system, Types of CT scanners and CT Generations, collimation, filtration, detectors in CT, Spiral and multi slice CT. CT Imaging Systems- Image reconstruction and Processing, Filtered back projection, Image acquisition, Scanned Projection radiographs, Axial CT, Helical CT, MDCT, Cardiac CT, CT Fluoroscopy, Artefacts in CT.

7. Magnetic Resonance Imaging physics: Basic Physics of MRI- NMR, relaxation and tissue contrast-T1 and T2 relaxation, Spatial encoding and basic pulse sequences-slice selection, frequency and phase encoding, gradient echo imaging, spin echo imaging, multi slice imaging. MRI equipment and Hardware, gradient coil, common imaging options, image acquisition and reconstruction-gradient echo sequences, spin echo sequences, inversion recovery sequences, MR angiographic sequences, flow measurements, MR spectroscopic sequence, Multi-slice imaging, 3D imaging. Image Quality and Artefacts in MRI- Motion, aliasing, metal objects, chemical shift, truncation, system related artefact, Bio safety in MRI.

8. Physics of Ultrasound: Physics of Ultrasound, Production of ultrasound waves, interaction of ultrasound waves, Ultrasound systems, Image Display, Doppler Effect-Doppler Scanning principles. Continuous wave Doppler, Pulsed wave Doppler, Electronic focusing and beam steering, three-dimensional and four-dimensional imaging, Quality Assurance in Ultrasound, Bio effects of ultrasound.

9. Nuclear Medicine: Physics of Nuclear Medicine, Isotopes used in Nuclear Medicine- Production and Properties, Biological and Effective half-lives, Radio pharmaceuticals, Uptake studies, Scanners, Nuclear Medicine instrumentation, Gamma camera, Radio Immuno Assay, SPECT, PET, PETCT.

10. Xeroradiography and DSA-General principle-photo conduction xeroradiography system, Patient exposure. DSA- Introduction, principle, Techniques, DSA systems and patient dose,

Section B: Physics of Radiotherapy

1. Clinical radiation generators: introduction. Kilo Voltage Machines, Van de Graaff generators, Betatron, Cyclotron, Synchrotron, microtron, Neutron Generators.
2. Teletherapy Machines: Introduction, machines using radionuclides, production and properties of telecobalt sources, telecobalt units, source housing, shutter mechanisms, beam collimation, penumbra, source transport mechanism, advantages and disadvantages of telecobalt machines.
3. Linear accelerators: Introduction, linear accelerator systems, Construction, production of electron and X-ray beam, magnetron, klystron, treatment head, penumbra, target, scattering foil, beam flattening filter, beam collimation, gantry, Electron cones, FFF. Laser systems.
4. Dose distribution and scatter analysis: Phantoms, Inverse Square Law, depth dose parameters, percentage depth dose, tissue air ratio, backscatter factor, tissue maximum dose tissue phantom ratio, scatter air ratio, variations with field size, depth, quality of beams, penumbra, equivalent square Fields, SSD and SAD techniques, simple Treatment calculations, Beam Modifying Devices - Wedge filters, wedge factors. Bolus, beam shaping blocks, Irregular fields, radiation field analyser. Introduction to treatment planning- 2D and 3D planning, isodose charts, isodose curves, combination of radiation field, parallel opposed fields, edge effect multiple fields, ICRU volumes-GTV, CTV, PTV, computerized treatment planning systems, tissue Compensators, correction for contour irregularities and tissue inhomogeneity, Total body irradiation
5. Imaging Modalities and Networking System in Radiotherapy: Patient data acquisition-body contours, localization of internal structures, devices- CT, MRI, ultrasound, SPECT, PET, treatment verification -port films, electronic portal imaging, cone beam CT-kVCBCT, MVCBCT, Networking systems -PACS, DICOM
6. Patient positioning, Simulation and Mould room techniques: Patient positioning-general guidelines, the XYZ method of patient setup. Treatment simulation-conventional simulators, CT simulator, Virtual Simulation, Target Driven Simulation, Immobilization devices and Mould Room techniques- Introduction- need for immobilization-accuracy and reproducibility, Immobilization devices. Preparation of moulds, Thermoplastic masks, Bolus, Compensator, Electron cut out, Shielding Blocks- Customized Field shaping, Styrofoam Cutter Machine.
7. Electron Beam therapy: Introduction, electron beam characteristics, treatment planning, field shaping, electron arc therapy, total skin irradiation.
8. Brachytherapy - Introduction, Brachytherapy sources production and properties, types of sources needles, tubes and wires, source specifications, Classification of Brachytherapy techniques - surface mould, intra cavitory, interstitial and intra luminal, Intra operative, Endovascular techniques, remote after loading. Calculation of dose(basic only), implant dosimetry systems-Patterson parker system, Quimby system, memorial system, Paris system, dose specification for cancer of cervix- Manchester system, ICRU system. Low dose rate (LDR), Medium Dose rate (MDR) high dose rate (HDR) and pulsed dose rate (PDR) brachytherapy. HDR units, prostate implants
9. Modern Radiotherapy Techniques:
3D Conformal radiotherapy-introduction, imaging data, 3D CRT techniques
IMRT-Introduction, IMRT systems-fixed gantry angle, tomotherapy, IMRT with rotating cone beams.
Stereotactic radiotherapy and radio surgery- Introduction, SRS techniques, x knife, gamma knife.
IGRT-Introduction, IGRT technologies, management of respiratory motion.

Proton therapy- Introduction, basic physics, bragg peak, Proton beam delivery systems,

Part II – Paper II
Radiography Techniques
Section A

1. History of Radiography and Imaging, Care and Ethics in Radiology :
Introduction, history of radiography, x ray room, ventilation and temperature of X-ray room, dark rooms, safe light storage shelves, cabinet, loading bench, hangers, solution tank, defects occurring in films while processing, viewing – Illumination and care of viewing boxes.
Medical law and ethics, Psychological approach to patient ethics followed in imaging female patient, organization to avoid delay, waiting and rest rooms, handling of fracture cases, stretcher and bed patient, method of dealing with helpless patient, Awareness of cross infection, general hygiene, special apparatus for children, neck and head injury patient, casualty management.
2. Positioning and techniques for various Projections -A Summary of the factors involved in radiographic positioning-introduction to radiographic techniques, general awareness about x ray techniques like details of xray table, collimation, anatomical land marks, immobilization, postural variations respiratory movement, regional densities, preparation, positioning terminology.
Radiographic technique for individual system-
Upper limb –Technique for hand, Wrist, fingers, thumb, scaphoid, carpal bones, carpal tunnel, forearm, elbow joint, humerus, shoulder Coracoid Process, Acromio-clavicular joint, clavicle, sterno-clavicular joint, Glenohumeral joint, scapula.
Lower limb – Leg Alignment, -Technique for foot, Subtalar joint, toes, great toe, calcaneum, ankle joint, leg, knee joint, patella, femur, Hip joint, Sacro-iliac joint, upper third of femur.
Vertebral column – Vertebral curves and Vertebral Levels, Atlanto-occipital articulation, cervical vertebra, Cervico-thoracic vertebra, swimmer's view, thoracic vertebra, thoraco-lumbar vertebra, lumbar vertebra, lumbo-sacral vertebra lumbo-sacral articulation, sacrum, coccyx. Bones of the thorax-techniques for ribs-upper and lower, sternum.
Skull-Cranium, Sella turcica, optic foramen, Jugular foramina. Temporal bones-Mastoids, petrous bone, Nasal bones, Mandible, Techniques for mandible, Temporo-mandibular joint.
Paranasal sinus - Techniques for frontal – maxillary, ethmoid, sphenoid. Facial bones Thorax, Pharynx, Larynx and Trachea
Respiratory system and Heart – Technique for trachea, lungs, mediastinum, Sub-diaphragmatic conditions – erect and supine chest x ray – projections relative to collapse.
Chest, Abdomen, Pelvic Cavity, Acetabulum
3. Dental Radiography: Introduction-vertical and horizontal positioning abnormalities, use of general and dental units, dental request formula identification and handling of films, use of dental film holders. Technique for full mouth, edentulous subjects, children, intra oral and extra oral crowns, occlusal views, localization. Intra-oral radiography, occlusal radiography, extra oral radiography- oblique lateral view.
4. Trauma Care - Bedside Radiography – techniques for acute chest, intestinal obstructions – abdominal perforation – vertebral injuries, skull injuries – spine fractures – Thomas splint, Plaster cases etc.
5. Operation Theatre Radiography-Theatre Techniques, Techniques of Asepsis- anaesthetic dangers – precautions.
6. Record keeping in Radiography– Register of X-ray examinations, Despatch register, Film accounts, Machine Log book Maintenance.

Section B

1. Special investigations(Conventional Radiography)- Introduction to Contrast Media -Types, Positive, Negative, water soluble,water insoluble, ionic, non-ionic,Structure of Contrast media, Patient Preparation,Route of Administration, Toxicity and Complications in radiography, CT and MRI.
Special Investigation of individual systems-
 - a. GI Tract- Contrast media – Basic principles – Barium Sulphate, Pharynx and oesophagus, – erect and supine posture – – stomach, duodenum, small intestine, colon and rectum, fluoroscope – compression techniques. single and double contrast techniques, enteroclysis
 - b. Urogenital System – IVU– principles – contrast medium – preparation of patient – children – Serial radio-graphs, variation of time intervals depending on suspected pathology, value of compression – precautions and contra indications. Retrograde pyelography (RGP), RGU, MCU. Approximating cysto-urethrogram.
 - c. Hysterosalpingography (H. S. G) – Principles – contrast media, method for injection – reactions – fluoroscopy- technique.
 - d. Sialography – Sialography – contrast medium – method of injection and techniques,Technique following injection of opaque medium.
 - e. Salivary Glands – Demonstration of opaque salivary calculus, techniques for parotid, sub mandibular-sublingual-glands and ducts.
 - f. Liver and spleen – Technique of PTC, SPV. Gall bladder – Technique for oral cholecystography – PTC – preparation of patient – contrast medium, and intravenous cholangiogram, T Tube Cholangiogram
 - g. Nervous system– special care of neurological patient - myelogram Ventricles – Ventriculography, Encephalography
 - h. Bronchography – Lymphatic system – lymphangiography,
 - i. Breast -ductography techniques
 - j. Lacrimalducts
 - k. Angiography- Principle-contrast media, method of injection, DSA, Venogram
 - l. Fistulogramand Sinusogram
 - m. MMR, Soft issue Radiography.
2. PediatricRadiography- Introduction to pediatric radiography, Paediatric radiography techniques, safetyconsiderations in pediatric radiography,portable radiography in pediatrics.
3. Digital Radiography and Advances in Medical Imaging, Image investigation techniques.

Part II – Paper III
Basics of Radiotherapy
Section A

1. Ethics,epidemiology, prevention of cancer:Principles of ethicsin health care, enforcing standards in health profession promoting quality care, Professional ethics in patient care delivery, ethical principles related to radiation oncology.Maintenance of radiation treatment charts and treatment records.How to interact with a patient getting radiation treatment, Life saving measures (first aid) in emergency situations, how to answer common doubts of patients getting treatment, role of radiotherapy technologist as a radiotherapy team member.
Epidemiology, cancer registry, prevention of cancer, early detection.
2. Oncopathology: Introduction, Pathological classification of malignancies, grading, staging,Importance for relevant staging for selection of radiation treatment techniques.
- 3.Cancers of various sites: Head and neck- Larynx, Hypopharynx, nasopharynx, oropharynx, oral cavity, ear, parotid, maxillary antrum, orbit, thyroid, Lungs, oesophagus, stomach,

- rectum, anal canal, breast, CNS tumours, pancreas, Cervix Endometrium, Vulva, vagina, Prostate, Penis, testicular malignancy, Urinary bladder, Lymphomas – Hodgkin's, NHL, sarcomas. Paediatric tumours like Wilm's tumour, Medulloblastoma, Neuroblastomas.etc
4. Methods of Cancer Management- Medical Oncology, Chemotherapy, Neoadjuvant, adjuvant, concurrent chemo- Radiotherapy (terms only), Surgical Oncology, Radiation oncology
 5. Radio-biological basis of radiotherapy: Introduction, radiobiology – cell killing, DNA breaks, lethal damage, sub lethal damage, oxygen effect, Cell survival curve, Cell cycle, radio sensitivity. Normal tissue reactions to radiation – Early, late reactions of various organs – skin, Buccal mucosa, heart, lung, kidney, spinal cord, brain, intestine, rectum, bladder, testes, ovary, eye. Tolerance dose general ideas.

Section B

1. Treatment planning- Introduction, clinical aspects of Teletherapy, Brachytherapy, treatment simulation– conventional and CT Simulation, treatment planning. 2-D, 3-D planning, brachytherapy treatments –interstitial, intracavitary and mould treatments, after loading techniques. At the time of treatment execution the radiation oncologist must teach the students how it is carried out, familiarize the students with various medical terms relevant to radiation treatment
2. Radiotherapy Techniques for various tumours- head and neck- Larynx, Hypo pharynx, nasopharynx, oropharynx, oral cavity, ear, parotid, maxillary antrum, orbit, thyroid, Lung, oesophagus, stomach, rectum, anal canal, Breast, CNS tumours, Pancreas uterine cervix, endometrium vulva, vagina.
Prostate, Penis including mould treatment, testicular malignancy, urinary bladder.
Lymphomas – Hodgkin's, NHL. Sarcomas-mantle fields, sbtotal irradiation, IFRT). Sense organs.
Paediatric tumours like Wilm's tumour, medulloblastoma, neuroblastomas etc. Palliative irradiation
3. Brachytherapy: Introduction, brachytherapy techniques- Interstitial, intracavitary, Intraluminal and mould applications.
Clinical application of Brachytherapy on various cases.
4. Modern Radiotherapy (basics only) and nuclear medicine: 3D Conformal Radiotherapy- familiarize the students with advances in radiation treatment like 3D, CRT, IMRT, Stereotactic irradiation, IGRT etc
Nuclear Medicine- Introduction, clinical aspects of nuclear medicine, applications of nuclear medicine for cancer diagnosis and treatment, isotopes used. Radioiodine uptake study, Thyroid malignancy- classification of thyroid malignancies, general outline of treatment of various thyroid malignancies, Radioiodine treatment and its indications.

Part III – Paper I

Radiation Safety in Radiodiagnosis and Radiotherapy (120 hrs)

1. Basic Radiation Physics: Atomic structure, Nucleus, Atomic number, mass number, Electron Orbit and energy levels, isotopes and isobars, radioactivity, radioactive decay, half-life, Particle radiation, Electromagnetic radiation, Production of X-Rays, Continuous X-Ray Spectrum, Bremsstrahlung radiation, Characteristic X-rays, Filters, Quality of X-rays, Effect of voltage and current on the intensity of X-rays, Properties of X-rays.
2. Interaction of Radiation with matter- Photoelectric effect, Compton Effect, Pair Production, Ionization of matter, Energy absorbed from X-rays, X-rays scattering, X-rays transmission through the medium, linear and mass attenuation coefficient, HVT and TVT, Interaction of charged particle and neutrons with matter.

3. Radiation Quantities and Units: Radioactivity, Flux, Fluence, Kerma, Exposure, Absorbed Dose, Equivalent Dose, Weighting Factors, Effective Dose, Natural Background radiation, Occupational Exposure limits, Dose limits to public.
4. Biological Effects of radiation-The Cell. Effect of ionizing radiation on cell, chromosomal aberration and its application for the biological dosimetry, Somatic effects and hereditary effects, stochastic and deterministic effects, Acute exposure and chronic exposure, LD_{50/60}
5. Detection and Measurement of radiation & measuring instruments- Ionisation of gases, Fluorescence, and phosphorescence, Effect of photographic emulsion, Ionisation chambers, Proportional counters, G M counters, Scintillation Detectors, Liquid scintillator, Pocket Dosimeters, TL Dosimeters and their uses in personnel monitoring badges. Advantages and disadvantages of various detectors, appropriateness of different types of detectors for different types of radiation measurement
6. Radiation Hazard evaluation and control (Diagnostic radiology)
Philosophy of Radiation Protection, Effect of Time, Distance and Shielding, Calculation of workload, calculation of weekly dose to the radiation worker and general public, good work practices in diagnostic radiology, Planning consideration for radiology installation including workload, use factor & occupancy factors, effect of different shielding material.
7. QA in Diagnostic Radiology
QA programs for X-ray tubes and generators, screen film radiography, Digital Radiography, CT, Mammogram, Verification of optical and radiation field congruence, Beam alignment, Focal Spot size, Linearity of tube current mA, and Timer, applied potential, HVT and total Tube filter, Contact between film and intensifying screen, Contrast resolution, Grid alignment, Special Techniques like mammography, CT and Digital Radiography.
8. Regulatory requirements:
National Regulatory Board, Responsibilities, organization, Safety Standards, Codes and Guides, Responsibilities of Licensees, registrants and employers and Enforcement of Regulatory requirements, Role of technologist in radiology department, Dose limits
9. Radiation safety considerations in diagnostic radiology
Principle of Justification and Optimization, ALARA, Radiation safety consideration in Conventional radiography and Digital radiography, Radiation safety consideration in Mobile radiography, Radiation safety consideration in Mammography, Radiation Safety considerations in Dental Radiography, Radiation safety consideration in Fluoroscopy, Radiation safety consideration in CT. Medical exposure, Dose indexes, CTDI etc.
10. Demonstration/Practical
Time, Distance and Shielding, measurement of HVT & TVT.
Familiarization of radiation survey meters and their functional performance check.
Radiological Protection Survey of Diagnostic X-ray installation.
Familiarization with QA equipment and QA tools in diagnostic radiology
Quality Assurance of conventional X-ray equipment
Quality Assurance and radiation protection survey of a CT Scan installation
Demonstration for checking the shielding adequacy of protective accessories (lead apron/mobile protective barriers MPB)), Investigation of reported excessive exposure of TLD, its genuineness and estimation of actual dose received

Section B

Radiation Safety in Radiotherapy

1. Radiation Hazard evaluation and control (Radiotherapy)- Philosophy of Radiation Protection, Effect of Time, Distance and Shielding, Calculation of workload, calculation of weekly dose to the radiation worker and general public, good work practices in radiotherapy practices including Teletherapy and Brachytherapy, Planning consideration for radiotherapy installation including workload, use factor & occupancy factors, effect of different shielding material.
2. Basic Radiation therapy Physics: Historical Developments in Radiotherapy, Physical components of Telecobalt Unit/Linear Accelerator Unit/ Remote After loading Brachytherapy Unit/ Gamma knife Unit/ Simulator and their descriptions. Various types of sources used in Radiotherapy and their properties, Physics of photons, electrons, protons and neutrons in radiotherapy, physical parameters of dosimetry such as Percentage Depth Dose, Tissue Air Ratio, Tissue Maximum Ratio, Physics of bolus and phantoms materials, compensators, wedges, shielding blocks, patient immobilization devices, port film, processing and development, special techniques in Radiotherapy such as SRS, SRT, IMRT, IGRT and Tomotherapy.
3. QA in Radiotherapy: Accessories and tools used for QA tests in Radiotherapy such as Front pointer, Back pointer, Laser alignment etc, Optical and radiation field congruence, Beam shaping blocks, Beam shaping jaws, Delineator/ Diaphragm movements, Isocentre alignment, Patient support system, Beam on and off mechanisms, Technician's role in QA tests on telecobalt/ linear accelerator/ brachytherapy/ gamma knife/ simulator/ CT simulator machines
4. Radiation Emergency Preparedness: Safety and security of radiation sources, case history of emergency situations and preparedness, equipments and tools including role of Gamma Zone Monitor, Regulatory requirements and prevention of emergency, Preventive maintenance and safety culture, Role of technicians in handling radiation emergencies.
5. Regulatory requirements: National Regulatory Body, Responsibilities, organization, Safety Standards, Codes and Guides, Responsibilities of Licensees, registrants and employer and Enforcement of Regulatory requirements.
- 6 Demonstration: Time, Distance and Shielding, measurement of HVT & TVT. Familiarization of radiation survey meters and their functional performance checks Radiotherapy Simulator/ CT Simulator installations QA on X-Ray, Simulator and Radiotherapy equipments. Procedures followed for calibration of measuring and monitoring instruments.

PART III PAPER II

Advanced Medical Imaging Technology

Section A

1. Digital Radiography – Introduction, history and development, Direct and indirect digital radiography, digital Fluoroscopy system – digitized image-digital subtraction techniques – digital image processing- future equipment developments – clinical application – Digital Image quality – Laser film printers. Image acquisition – Digital Spot Imaging (DSI) – Digital chest radiography – future developments, CR.
2. Mammography Technique -Background, diagnosis and screening. Imaging Techniques, compression, image quality- Interventional accessories – biopsy equipment attachments, Digital Mammography.
3. Ultrasound –Introduction, Terminology- Different types of machines – portable etc. Doppler, Clinical applications. Image display & recording systems-transducers (scanning probes) –

- types and shapes-choice, care and maintenance – recording devices, Orientation of the image – focus of the beam – sensitivity and gain – artefacts-quality control-acoustic coupling agents,
4. Computed Tomography - Historical information, Technologic considerations, Basic Principles in CT scanning- Radiation Dose, Patient preparation, Paediatric CT, Contrast Media, Filming, Despatch.

Cross Sectional Anatomy related to CT Scanning,

CT Techniques of Brain, Spine, Head and Neck, Chest, Abdomen, Pelvis, Extremities.

Basic Principles of CT contrast Media- Oral, IV, Rectal, Intrathecal. CT Angiogram- Triple Phase CT -Pressure Injectors. CT Myelogram

HRCT- Lung, Temporal Bone, CT Cisternogram. Cardiac CT, CT Perfusion Techniques, CT Enterogram, CT Enteroclysis. Reconstruction Techniques, -VRT, MPR, Virtual Endoscopy, Navigation etc.

CT artefacts and their clinical significance

CT advantages and limitations, Future developments. Dual energy CT- Dual energy CT equipment - Basic principle- clinical applications.

Section B

1. Magnetic Resonance Imaging: Introduction - MRI Historical information, Technologic considerations, Basic Principles in MRI scanning-Patient Preparation, MRI safety-Patient and Technologist, Patient Registration to Machine, Selection of Protocol, Selection of sequences, Contrast, Termination of studies, after care of the patients, Image Reconstruction Techniques, Filming Techniques, Despatch

Sectional Anatomy related to MR Imaging.

MR Techniques of Brain, Spine, Head and Neck, Chest, Abdomen, Pelvis, Extremities, Joints, Breast, Soft Tissues,

Routine sequences and Protocols, ASL

MR angiogram- TOF and Contrast- Venogram, Pressure Injector

Cardiac MR- Different Sequences- Spin echo Gradient Echo, Fast imaging sequences, Fat suppression, Fluid suppression, SWI, Diffusion Imaging -DWI, ADC, DTI, MR spectroscopy techniques and Applications

MR Perfusion Imaging.

Functional Imaging

Artefacts in MR Imaging.

Advantages and Limitations, Future Developments.

2. Picture Archiving and Communication System(PACS): Introduction, Technique of storing retrieving, presenting and sharing images like x-ray, ultrasound; CT scan and MRI. DICOM images PACS, VNAs and RIS PACS Architecture Cloud PACS
3. DSA – Basic Principles and Clinical applications, Equipment and operation, Serial imaging devices-subtraction process, accessories and choice-catheters, guide wires, Interventional Angiography: Accessories and uses e.g.: coils/stents, pressure Injectors: Types, programming, injection protocols and uses. DSA Subtraction process, injection pump, cine camera, optical system, film processing. Interventional Radiology- Practical Interventional radiology in the diseases of the Hepato-biliary, GIT, Urology, Vascular System and other areas, Indications and contraindications, pitfalls and complications, role of

radiographer/imaging technologist in interventional procedures, CT guided procedures: Fine needle aspiration cytology, fine needle aspiration biopsy. Fluoroscopy guided procedures: endoscopic retrograde cholangio-pancreatography (ERCP); percutaneous nephro-lithotomy; percutaneous nephrostomy; percutaneous trans hepatic biliary drainage, embolisation, liver biopsy, Vascular Intervention Techniques. Radio frequency ablations Procedures.

4. Nuclear Medicine- Basic principle Instrumentation-Gamma camera, SPECT, PET, clinical Applications-newer developments

Part – III, Paper – III ADVANCED RADIOTHERAPY

Section A

1. Introduction: Local and general effects of tumours and its spread, carcinogenesis, Co-morbidities
2. Prevention and early detection: Etiology and epidemiology, Signs and symptoms, public awareness on early signs and symptoms, genetics. High risk groups.
3. Tumour Biology- Cell kinetics, Cell cycle, control mechanisms, pathology of tumours, staging of tumours, classification of tumours of various sites.
4. Tissue structure and radiation effects and Fractionation - Tumour control probability (TCP), Normal Tissue Complications Probability (NTCP), models, acute and late side effects of radiation, radiation sensitizers/protectors/side effect reduction. 4R in radiotherapy. Effects of radiation on normal tissues and malignant tumour- Early and late reaction on Skin, Mucous membrane, GI tract, Genito urinary system, respiratory system, CNS, Tolerance Dose of Normal structures
Fractionation in radiotherapy-different fractionation schedules etc
5. Treatment combinations -Introduction, combination of treatments, chemo radiation etc, treatment scheduling.
6. Application of radiotherapy in benign conditions
7. Principles of positioning and immobilization- Positioning aids-Breast boards, Lung boards, Belly boards, Head-and-neck fixation devices, Vacuum packs, Stereotactic systems etc, Internal organ motion control- Bite blocks, Gating systems, Active breathing control, Diaphragm compression, Prostate immobilization, Tracking systems. Laser/ positioning systems, marking systems, Reference points
8. Image acquisition and verification: Image acquisition for planning, modalities for image acquisition for planning. Treatment verification-modalities and methods of treatment verification.
9. Patient set up: Introduction, evaluation of patient setup for simple techniques, use of Beam modifying devices, such as wedges, tissue compensators, mid Line Block (MLB) in the treatment of respective sites. Customized shielding blocks, asymmetric collimators and their use
10. Simulation procedures including CT simulation of various cancers.

Section B

1. Clinical radiation oncology of various cancers: Head and Neck, Lung, GIT, Breast, CNS tumours, Genito Urinary cancers.
Lymphomas, HL, NHL, IRT, INRT, Sarcomas, Total body Irradiation-total hemi body Irradiation. Paediatric Tumours, Palliative Radiotherapy, Priming patient for BMT. Radio immunotherapy.
2. Recent Advances in radiotherapy such as 3DCRT, IMRT, IGRT, SRS, SRT, Tomotherapy, SBRT, electron therapy, proton therapy and their clinical applications

3. Brachytherapy- HDR LDR MDR, Clinical Applications of Interstitial implantation, template based interstitial implantation, intraluminal brachy therapy, Intra cavitary Brachytherapy, Surface mould treatments, Temporary and Permanent implants, Intra operative Brachytherapy, Endovascular Brachytherapy, Different types of Brachytherapy Applicators,
4. Duties and responsibilities of radiotherapy technologies/radiographers: Introduction, ethics, approach and attitude towards patients, nursing and medical staff. Clinical care of patients, local and systematic reactions, accuracy in treatment, handling and care of apparatus and accessories, Maintenance of record

3. Scheme of teaching and Clinical Training

First Year: General and Radiation Physics, Anatomy, Physiology & Pathology

Second Year: Physics of Medical imaging and Radiotherapy, Radiography Techniques, Basics of Radiotherapy

Third Year: Radiation safety in Radiodiagnosis and Radiotherapy, Advanced medical imaging technology, Advanced Radiotherapy

Note: clinical postings include Night shifts also

Year	Subject	No of Hours
2	A. Theory- Part I	540 hours (Minimum)
	1. General & Radiation Physics	150
	2. Anatomy	130
	3. Physiology & Pathology	260
	B. Practicals & Clinical Posting	1000 hours (Minimum)
	B.1	
Second Year	1. Radiology Reception & Film Dispatch	100
	2. Dental Radiography	150
	3. X-ray dark rooms	100
	4. General X-ray Procedures	150
	TOTAL	500 (Minimum)
	B.2	
	1. Radiotherapy Machines and Mould room,	100
	3. Oncology and Radiotherapy OPD	250
	4. Radiation physics and Treatment Planning	150
	TOTAL	500 (Minimum)
	A. Theory- Part II	450 hours (Minimum)
	1. Physics of Medical Imaging and Radiotherapy	150
	2. Radiography Techniques	150
	3. Basics of Radiotherapy	150
	B. Practicals & Clinical Posting	1100 hours (Minimum)
	B.1	
	1. DR and CR	100
	2. Radiography	150
	3. CT Scan	300
	Total	550 (Minimum)
	B.2.	
	1. Radiotherapy machines, reception, simulator, brachytherapy etc.	325
	2. Radiation Physics (therapy)	200
	3. Nuclear Medicine	25
	Total	550 (Minimum)

Third Year	A. Theory- Part II	450hours (Minimum)
	1. Radiation safety in Radiotherapy and Radiodiagnosis,	150
	2. Advanced medical imaging technology,	150
	3. Advanced Radiotherapy	150
	B. Practicals& Clinical Posting	1100 hour(Minimum)
	1. MRI	300
	2. DSA and IR	150
	3. Mammography	25
	4. Ultrasound	25
	5. Radiation Physics,QA, and Radiation safety(diagnosis)	50
	Total	550 (Minimum)
	1.Radiotherapy OP	100
	2. Teletherapy, Linear Accelerator, Telecobalt Mould Room Simulator, brachytherapy	300
	3. Radiation Physics & Radiation Safety(therapy)	100
	4. Nuclear Medicine	50
	Total	550(Minimum)

4. Records/Log Book

The Practical records shall be maintained & submitted at the end of the course duly certified by the concerned Faculty and HOD.

5. TEACHING /LEARNING AIDS

5.1 Text Books

1. Christensen's Physics of Diagnostic Radiology by Thomas Curry
2. Human Anatomy by B D Chaurasia's
3. Textbook of Anatomy by Dr Sreedevi's
4. Textbook of Physiology, Guyton and Hall
5. Essentials of Medical Physiology by K Sembulingam
6. Anatomy and Physiology for Radiographers - C.A. Warrick
7. Radiographic Imaging-Chesney & Chesney,
8. Care of patient in diagnostic Radiography - Chesney & Chesney.
9. Clarks Positioning in Radiography by Imaging by Stewart Whitley et al
10. Textbook of radiology for residents and technicians by Bhargava S. K
11. Diagnostic Radiography Glenda.J. Bryan (ELBS)
12. Recent advances in Radiology and Medical Imaging" Lodge & Steiner Interventional radiology-Principles and Techniques by J Ring and Mclean
13. Radiation Protection in Hospitals. Richard F.Mould
14. Perez & Brady's Principles and Practice of Radiation Oncology
15. The Physics of Radiation Therapy Faiz M. Khan and John P. Gibbons
16. Practical Radiotherapy Planning by Dr. Jane Dobbs , Professor Ann Barrett et al
17. Radiobiology for the Radiologist by Eric J. Hall,

Other materials to study

1. AERB safety Codes for Diagnostic Radiology, Radiotherapy, Nuclear Medicine
2. Atomic Energy Act and Radiation Protection Rules, Govt of India.

5.2 Reference books:

1. Gray's Anatomy by Henry Gray.

2. Radiographic Anatomy – Meschan
3. InderbirSingh's text book of human Histology
4. Gross Anatomy by I B Singh
5. Gross Anatomy by Vishram Singh
6. Dutta's Textbook of Anatomy
7. Basic Anatomy and Physiology for Radiographers by MRE Dean
8. Surface and Radiological Anatomy by A Halim
9. Principles of Physiology, DebasisPramanik
10. Ganong's Review of Medical Physiology
11. Basic Pathology by Robbins, Angell and Kumar
12. Fundamental Physics of Radiology W. J. Meredith J. B. Massey
13. Medical Imaging Physicsby William R. Hendee, E. Russell Ritenour
14. MRI: The Basics Ray H. Hashemi, Christopher J. Lisanti, William Bradley
15. MRI basic Principles and Applications Nark A brown

1. Diagnostic Imaging by Peter Armstrong
2. Computed Tomography (Approaches Applications and Operations by Ehsabn Samuels Norbert J Pelc
3. MRI from Picture to Proton Donald W. McRobbie
4. Handbook of MRI Technique, Catherine Westbrook
5. MRI in Practice by Catherine Westbrook
6. MRI Hand Book MR Physics Patient Positioning and Protocols by Muhammed, Elmaoğlu
7. Practical approach to Angiography by Irwin. S. Johnsrude
8. Technologists Guide to mammography by Regan
9. Radiology of Anaesthesia and Critical Care by Christine H Murphy
10. Radiology in Dental Practice Herbert Frommer
11. Interventional radiology Principles and Techniques by Wilfrido R Castaneda
12. Hand Book of Interventional Radiographic Procedures by Krishna Kandarpa and John E Aruny
13. Producing quality Radiographs Angelin M Cuilnnan
14. Atlas of Roentgenographic Positioning by Merrill
15. Children's Radiographic techniques by Feshartlefyl
16. Special procedures in Radiology by Sagal
17. Synopsis of Radiological Anatomy with CT by Meschan
18. Basic Medical Techniques and patient care for Technologists by Zillam S Torres
19. Advances in Ultrasound techniques and Instrumentation by Peter Well
20. An Atlas of Normal radiographic Anatomy by IsadoreMeschan
21. Radioisotopes and Bone by Franklin Mclean
22. Radiographic Examination of the small Intestine-Roentgenographic Techniques by Ross Golden
23. X ray technology by Charly A Jacobi
24. Nuclear Medicine Instrumentation by Jennifer Prekeges
25. Nuclear Medicine Technology Study Guide by AndrzejNóniuszko
26. Radio-biology for the Radiologist by Eric J. Hall, Amato J. Giaccia
27. IAEA Safety Series
28. Treatment planning & dose calculation in radiation oncologyGunillaCarlesonBentel
29. Clinical Radiation Oncology Leonard L. Gunderson and, Joel E. Tepper

5.3. Models/Charts:As supported and decided by the concerned Faculties.

6. EXAMINATION:

6.1 Scheme of internal assessment –Regular internal assessment through written & practical examination shall be conducted. Minimum of 3 internal assessment & one model examination to be conducted & average of these marks (highest three out of all) are to be tabulated out of 50 and presented to the DME before the final examination.

6.2 Final examination

6.2.1 The Authority to conduct the examination: The Director of Medical Education, Government of Kerala

6.2.2. Frequency: Regular examination shall be conducted at the end of the 1st and 2nd year and 3rd year. Supplementary examination shall be conducted 6 months after the regular examination.

6.2.3. Eligibility

3 Eligibility for writing examination

- Minimum of 80% attendance in theory & practical is required to appear for the final examination with the provision for one time condemnation up to 10% on medical grounds (condonable limit 70%). Authority for condemnation for shortage of attendance shall be vested with Director of Medical Education, Govt of Kerala.
- Certificate of satisfactory completion of the course
- A candidate who has not attained 80% attendance and the shortage is beyond the condonable limit he/ she shall not be eligible to continue the course with the same batch of students. He/ She may obtain special sanction (Condemnation of Break of Study) from the Director of Medical Education to study with the junior batch of students.
- A candidate may be permitted to attend the third year classes if she/he has sufficient attendance. However course completion certificate and permission to write the final year examination will be provided only if she/he pass the first and second year papers.

6.2.4. Schedule of Examination

1. Regular examination shall be conducted at the end of the academic year which includes theory, practical & Viva voce.

2. Total 9 Papers (3 papers in the 1st year and 3 papers in the 2nd year and 3 papers in the 3rd year)

Each paper shall be of duration of 3 hours with total marks of 100 each. Each paper shall have 2 sections- Section A & Section B.

6.2.5 Scheme of examination:

Maximum marks and minimum marks

Paper and Subjects	Theory						Practical and viva		Grand Total	
	DME		Internal		Total		Practical/Viva			
	Max	Min	Max	Min	Max	Min	max	min	Max	Min
First Year										
Part I Paper I	100	45	50	20	150	60	50	20	200	100
Part I PaperII	100	45	NA	NA	100	45	50	20	150	75
Part I PaperIII	100	45	NA	NA	100	45	50	20	150	75

Second Year										
Part I Paper I	100	45	NA	NA	100	45	50	20	150	75
Part II paper II	100	45	50	20	150	90	50	20	200	100
Part II Paper III	100	45	NA	NA	100	45	50	20	150	75
Third Year										
Part III Paper I	100	45	NA	NA	100	45	50	20	150	75
Part I II paper II	100	45	NA	NA	100	45	50	20	150	75
Part III Paper III	100	45	50	20	150	90	50	20	200	100

Scheme of Practical and Viva

Distribution of marks for practical/ Viva examination

First Year DRRT

Part I Paper I

Total Marks 50

- a. Viva voce only

Part I Paper II

Total Marks 50

- a. Identification from Charts and Models on the related subject 15
- b. Identification of Bones and related Parts 15
- c. Viva voce 20

Part I Paper III

- a. Viva Voce only

Total Marks 50

Second Year DRRT

Part II Paper I

Total Marks 50

- a. Identification from Charts and Models on the related subject 20
- b. Viva voce 20
- c. Logbook and Records 10

Part II Paper II

Total Marks 50

- a. X ray taking of various parts 20
- b. Discussion on X ray film taken 10

c. General discussion and Viva voce	10
d. Log Book and Records	10
Part II Paper III	Total Marks 50
a. General discussion and Viva voce	40
b. Log Book	10
Third Year DRRT	
Part III Paper I	Total Marks 50
a. Identification of radiation monitors and safety equipments and their use	20
b. Viva voce	20
c.. Log Book and record book	10
Part III Paper II	Total Marks 50
a. Taking CT scans of various parts and discussion of film taken parts	20
c MRI –Identification of sequences and MR contrast with films only	10
d USS, DSA, Mammogram discussion with films only	10
e Log Book and Records	10
Part III Paper III	Total Marks 50
a. General discussion and Viva voce on advanced radiotherapy	40.
B Log Book	10

6.3 Examiner: 6.3 Examiners

There will be one external and one internal examiners for practical and Viva Faculty with post graduate degree and post PG teaching experience of minimum one year in the concerned subject is eligible to be an examiner

6.4 Pass Criteria

Minimum of 45% of marks for theory paper with a minimum of 50% of marks in the total (theory and Practical) in each subject

6.4. Pass Criteria:

Minimum of 45% of marks for theory paper with a minimum of 50% of marks in the total (theory and Practical) in each subject

A minimum of 40% of marks in the oral/practical examination

A minimum of 50% aggregate marks of the grand total (Total theory, practical)

First year examination	-	250 out of 500.
Second year examination	-	250 out of 500
Third Year	-	250 out of 500

6.5. First class/Distinction/Rank

1. Candidates scoring 65% & above shall be awarded first class.
2. Candidates scoring 75% & above shall be awarded distinction.
3. Candidates who scores highest mark in the grand total (Theory, practical and internal assessment) shall be awarded the first Rank.

6.6. Revaluation: Any candidate who requires revaluation shall submit the request to do so

within 14 days of the official declaration of the result.

7. MODEL QUESTION PAPERS

GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
D.RRT. EXAMINATION
PART I - PAPER-I
GENERAL AND RADIATION PHYSICS

Max. Marks: 100 Time: 3 hours

(Answer Section A & B separately)

SECTION-A

- I. Explain the following (Marks 5x2=10)
- a) SI units b) Ohms law
 - c) Henry d) Bridge rectifier
 - e) Eddy Current
- II. Explain the following (Marks 5x4=20)
- a) Half-life. Find the activity of a cobalt 60 source after 8 Years if the present activity is 100 Curie
 - b) Cyclotron
 - c) Working of Moving Coil Galvanometer
 - d) Working of a PN junction diode
 - e) Characteristic and Continuous X Ray
- III. (Marks 2x10=20)
- a. What are transformers and explain the different types of transformers with figure.
 - b. What is rectification? Explain in-detail about the different rectifiers used in X-ray circuits?

SECTION-B

- I. Explain the following (Marks 5x3=15)
- a) Space charge effect b) Disadvantages of self-rectification
 - c) Thermo Luminescent Dosimeter d) HVT and TVT
 - e) Bragg curve
- II. Answer the following (Marks 3x5=15)
- a) Why Tungsten is used as target in X-ray tube
 - b) What is Inherent and Added filtration
 - c) Mention any five radiation Quantities and their Units
- III. Describe various interactions of radiation with matter and explain each interaction. (Marks 1x20=20)

**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
D.RRT. EXAMINATION-2019**

Time: 3 hours

Max. Marks: 100

PART I - PAPER-II

Anatomy

Answer all Question. Draw diagrams wherever necessary

SECTION A

1 Enumerate the parts of female reproductive tract. Describe briefly the anatomy of the ovary uterus and fallopian tubes. Mention the radiological investigation of female reproductive tract.
(Marks +2+2+1+2=10)

2 Enumerate the parts of Brain. Describe cerebrum cerebellum and blood supply of brain. Mention radiological investigation of the nervous system

(Marks 2+2+2+2+2=10)

3 Answer briefly on

(Marks 10x5 =50)

- a. Stomach
- b. Chambers of Heart
- c. Kidney
- d. Shoulder joint
- e. Urinary Bladder
- f. Femur
- g. Cartilage
- h. Lungs
- i. Ear
- j. Liver

4 Write short notes on

(Marks 10x3 =30)

- a. Epithelia
- b. Connective Tissues
- c. Neurons
- d. Pancreas
- e. Muscular Tissue
- f. Microscopic structure of Bone
- g. Humerus
- h. Synovial Joint
- i. Gall Bladder
- j. Pericardium

**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
D.RRT. EXAMINATION**

Time: 3 hours

Max. Marks: 100

PART I - PAPER-III

SECTION A: PHYSIOLOGY Max. Marks: 50

- I. Describe the transport of oxygen in blood. Mention the factors affecting Oxy-Haemoglobin Dissociation curve. Add a note on Hypoxia (Marks 5+2+3=10)
- II. **Write short notes on** (Marks 5x5=25)
 - a. Functions of plasma proteins
 - b. Composition and functions of pancreatic juice
 - c. Factors affecting Glomerular filtration rate
 - d. Regulation of blood pressure
 - e. Physiological actions of Thyroid hormones
- III. **Define the following** (Marks 5x2=10)
 - a. Anaemia
 - b. Cardiac output
 - c. Tidal volume
 - d. Resting membrane potential
 - e. Synapse
- IV. **Name the following** (Marks 5x1=5)
 - a. Two granulocytes in blood
 - b. Normal clotting time
 - c. Pacemaker of human heart
 - d. Female sex hormones
 - e. Receptors for vision

SECTION B: PATHOLOGY Max. Marks: 50

- I. Classify bone tumours. Describe clinical features, X-ray findings, macroscopic and microscopic findings of oestrogenic sarcoma. (Marks 3 + 7=10)
- II. **Write short notes on: -**
 - a. Radiation injury
 - b. Necrosis
 - c. Oedema
 - d. Rickets
 - e. ESR(Marks 5 X 5=25)
- III. **Define the following: -**
 - a. Leukaemia
 - b. Hyperplasia
 - c. Neoplasia
 - d. Jaundice
 - e. Tumour markers
- IV. **Name the following: - (Marks 5 x 2 = 10)**
 - a. Two causes of Granulomatous inflammation
 - b. Two examples of metaplasia
 - c. Two premalignant lesions
 - d. Two types of Acute leukaemia
 - e. Two cause of MCHC(Marks 5 X 1=5)

GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
D.R.R.T. COURSE EXAMINATION
PART II - PAPER-I
PHYSICS OF MEDICAL IMAGING AND RADIOTHERAPY
(Answer Section A&B separately) Time: 3Hrs. Max. Marks: 100

SECTION-A

- IV. Explain the following (Marks 5x4=20)
- a. Colour Doppler
 - b. T_1 and T_2 Relaxation Time
 - c. Characteristic Curve of radiographic film
 - d. Image Intensifier
 - e. CT Number
- V. (Marks 3x5=15)
- a) Describe Automatic Film Processor
 - b) Explain MRI
 - c) Explain Fluoroscopy
- VI. Describe the structure of X-Ray film and Film processing (Marks 1x15=15)

SECTION-B

- I. Explain the following (5x4=20)
- | | |
|------------------------|-------------|
| a) Back Scatter Factor | b) RIA |
| c) TAR | d) Penumbra |
| f) Simulator | |
- II. (3x5=15)
- d) Explain the Remote After loading technique in Brachytherapy
 - e) The PDD for a 15x15 cm² field size, 10 cm depth and 80 cm SSD is 58.4 for a Co-60 beam. Find the PDD for the same field size and depth for a 100 cm SSD
 - f) Explain the properties of radio nuclides used for Brachytherapy
- III. With the help of a block diagram, explain Linear Accelerator (1x15=15)

**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
D. R.R. T. COURSE REGULAR
EXAMINATION**

Time: 3 hrs. Max. Marks: 100

PART II- PAPER II

RADIOGRAPHY TECHNIQUES

(Answer Section A& B separately and draw diagrams wherever necessary)

Section A

1. Elaborate the Different views for Paranasal sinuses. Describe the techniques in Detail with the positioning, factors and Centering for each (Marks 5+10=15)

2. Write short notes on (Marks 5 x 7 = 35)

- a. Ten-day rule
- b. Radiographic views for Patella
- c. Handling of Fracture cases
- d. Ball catchers view
- e. Ward Radiography
- f. Views for sternum
- g. SI Joint views

SECTION B

1. Draw a simple labelled diagram of the components of the human urinary system.

Describe the indications, patient preparation and filming sequences for an IVU

(Marks 10+5= 15)

2. Write short notes on

(Marks 5x5=25)

- a. Barium swallow
- b. Sialography
- c. Paediatric Radiography
- d. Contrast Media reactions
- e. T tube Cholangiography

3. Explain the following

(Marks 5x2=10)

- a. RFA
- b. NMR
- c. CT number
- d. PACS
- e. PET

**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION**

D.R.R.T. COURSE REGULAR EXAMINA

Time: 3 hrs

Max.marks:100

PART II-PAPER III -BASICS OF RADIOTHERAPY

(Answer Section A& B separately and draw diagrams wherever necessary)

SECTION-A

- I. Describe the Staging of Carcinoma Breast. Explain radiation treatment to a post mastectomy woman with carcinoma breast? What is APBI?
(15+10=25marks)
- II. **Write short notes on the following**
- a. Radiation toxicities of head and neck irradiation
 - b. Cell survival curve
 - c. Cranio Spinal Irradiation (CSI)
 - d. Radiotherapy of Carcinoma urinary bladder
 - e. Brachytherapy treatment in carcinoma cervix
- (5x5=25)

SECTION-B

- III. Describe Staging of Carcinoma Cervix? Explain Radiation treatment of Carcinoma cervix? What are the toxicities of radiation treatment of carcinoma cervix?
(15+10=25 marks)
- IV. **Write short notes on:**
- a. Conventional fractionation
 - b. Mantle field irradiation
 - c. oncological emergencies
 - d. Radio Iodine Treatment
 - e. Radiation toxicities of pelvic irradiation
- (5x5=25 marks)

**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION**

D.R.R.T.COURSE EXAMINATION-

Time: 3 hours

PART III - PAPER-I

Max.Marks:100

RADIATION SAFETY IN RADIODIAGNOSIS AND RADIOTHERAPY

(Answer Section A&B separately)

Section A Define

- | | | |
|-----------------|-----------------|-------------------|
| A Filters | B Exposure | |
| C Deterministic | D. G M monitors | E Optical Density |
- 5x3= 15**

II

- A QA tools in Diagnostic Radiology **3X5= 15**

- B AERB Safety Codes in Diagnostic radiology

- D Role of Technologist in Diagnostic Radiology

III

- A Discuss various methods for reducing patient exposures in Diagnostic Radiology and

- Explain Radiation safety consideration in Dental Radiology **5+5= 10**

- B Explain QA tests in Mammography and DSA **5+5= 10**

SECTION B

II Define

- | | | |
|---------------------------|-------------------|-----------------|
| A HVL and TVL | B Equivalent Dose | 5x3 = 15 |
| C Tissue weighing factors | D LD50/60 | E Workload |

- II** A. Describe various types of sources used in Radiotherapy and their properties **3x5=15**

- B. Historical Developments in radiotherapy

- C. QA tools in radiotherapy

- III.** A. Draw a Radiotherapy room layout and label it and explain safety aspects **5+5=**

10

- B Explain QA tests in gamma Knife and Regulatory requirements in Radiotherapy **5+5=**

10

GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
D. R. R.T. COURSE REGULAR
EXAMINATION
Time: 3 Hrs
Max. marks: 100
PART II- PAPER III
ADVANCED MEDICAL IMAGING TECHNOLOGY
SECTION A

1 Describe the techniques of Mammography with Patient Preparation, Positioning, views, filming and Radiation Dose. (Marks 3x5= 15)

2 Write Short Notes (Marks 6x5= 30)

- a. CR cassettes
- b. Ultrasound transducer
- c. CT Angiography
- d. Digital radiography
- e. Triple phase CT
- f. Low Dose CT

3 Expand the following: (Marks 1x 5 = 5)

- a. HRCT,
- b. VRT,
- c. CTPA,
- d. MLO view
- e. CDI

SECTION B

1. Name the Different components of MRI machine; briefly describe MRI safety Precautions for both Patients and Technicians (Marks 5+5+5 =15)

2. Write Short Notes (Marks 7x 5 = 35)

- a. Seldingers' techniques
- b. Radioactivity
- c. Components of PACS
- d. Diffusion Imaging
- e. SPECT
- f. Microwave ablations
- g. MR contrast Agents

**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION**

D.R.R.T.COURSE EXAMINATION-

Time: 3 hours

PART III - PAPER-III

Max.Marks:100

Advanced Radiotherapy

Answer all questions. Draw diagrams wherever necessary.

Section A

- I. Describe in detail the epidemiology, clinical features, diagnosis, and treatment combinations in cancer of Breast . (5+5+5+5+5=25 marks)
- II. Short notes (5X5=25 marks)

- a) TCP an NTCP
- b) CT Simulator and Simulation Techniques for cancer of Tongue
- c) Effects of Radiation of Normal tissues
- d) Palliative care
- e) Application of radiotherapy on benign conditions

Section B

- I. Describe in detail the epidemiology, clinical features, diagnosis, staging and radiotherapy techniques for CNS tumors. (5+5+5+5+5=25 marks)
- II. Short notes (5x5=25 marks)

- a) Duties of Radiotherapy technologist in Radiotherapy.
- b) IMRT for Head and Neck cancers
- c) HDR Brachytherapy techniques for cancer of Oesophagus
- d) Paediatric Tumors
- e) RadioImmuno therapy

MINIMUM STANDARD REQUIREMENT-GENERAL
FOR DIPLOMA OPHTHAMIC ASSISTANCE COURSE (DOA)
CONDUCTED BY DME

1. General Description of The Course

No	Item	
1.1	Title of the Course	<u>DIPLOMA IN OPHTHAMIC ASSISTANCE(DOA)</u>
1.2	Aim of the course	To train students to be useful assistants in ophthalmology practice
1.3	Objective of the Course	To train the students to acquire knowledge and skill in testing of glasses ,retinoscopy, identifying common eye diseases, conducting camps and taking active role in prevention of blindness
1.4	Admission Capacity+ Enhancement slot	10 seats per batch. Enhancement as per the approval of State Council/State Govt.
1.5	Duration	2 Years + including 6 months- Internship
1.6	Academic Eligibility	A pass in the Higher Secondary Examination of the Board of Higher Secondary Education of Kerala or equivalent examinations conducted by any board in India recognized by any of Universities in Kerala with Physics, Chemistry and Biology as optional subjects and a pass with 40% marks in Physics, Chemistry and Biology put together, are eligible. Relaxation of 5% marks will be allowed to SC/ST candidates.
1.7	Mode of Selection	The selection of students shall be on merit basis, ensuring transparency and fairness. The process shall be as decided by the competent authority approved by the Government of Kerala/Central/State Council from time to time and in terms of the respective Course Regulations.
1.8	Allotting Authority	Agency approved by Govt. of Kerala
1.9	Seat Reservation	As stipulated by Govt of Kerala
1.10	Subjects to study	
1.10.1	1 st Year	Paper -I Basic Science in Ophthalmology, Visual optics
		Paper -II Optics and Refraction , Orthoptic techniques and Ophthalmic equipments
1.10.2	2 nd Year	Paper- III Common eye Disorders .Strabismus and Amblyopia
		Paper- IV Health Education, Community Ophthalmology ,Surgical instruments , Operation theatre sterilization
1.10.3	Internship	6 months internship in the parent institution or any other institution which is approved by the DME. It will be non stipendry.
1.11	Controlling Authorities	Central/State Councils, Central/State Govt, DME etc
1.12	Council Registration if any	Respective State Councils

1.13	Availability of the Course under DME	Refer DME/State Council Web Site
1.14	Scope for Higher Studies	B Sc Optometry

2. MINIMUM ELIGIBILITY TO APPLY FOR ESTABLISHING AN INSTITUTION AND STARTING DIPLOMA IN OPHTHALMIC ASSISTANCE COURSE (DOA) COURSE

2.1	<p>OWNERSHIP</p> <p>The applicant for affiliation shall be an institution owned and managed by:</p> <ol style="list-style-type: none"> 1. Government of India or the State Government, 2. An autonomous body promoted by Central and/or State Government, by or under an enactment for the purpose of Health Science Education, 3. A society registered under the Societies Registration Act, 1860 or corresponding Act in the State 4. A public, religious or charitable Trust registered under the Trusts Act or the Wakfs Act, 1954.
2.2	<p>ELIGIBILITY CRITERIA</p> <ol style="list-style-type: none"> 1. Health Science Education in the field of Paramedical and Allied Health Science subjects is one of the objectives of the applicant, in case the applicant is an autonomous body/registered society/charitable trust. 2. Suitable land is owned or obtained on lease for a sufficiently long period and possessed by the applicant-institution in its own name as under the regulations of the statutory council and as per the norms fixed by State Govt./ DME from time to time. 3. The land earmarked by the Management as stated in the application and in the sketch produced along with it shall be exclusively available for the purposes of the Institution. 4. The applicant owns and manages a hospital as required under the regulations of the statutory council and as per the norms fixed by State Govt./ DME from time to time. 5. Required Essentiality Certificate/ permissions from the respective Government as insisted by the Central/State Council, is obtained and produced along with the application. 6. The applicant possesses sufficient clinical facilities, financial resources, infrastructure and equipments as also sufficient faculty/man power as prescribed under the regulations of the statutory council and as per the norms fixed by State Govt./ DME from time to time. 7. The applicant shall NOT be one imparting educational Institutions conducting courses which are affiliated to agencies which are not approved by Govt. of Kerala/Central/State council/KUHS. 8. The Hospital, Clinical, Academic and other facilities should be owned by the same management. Other forms of hospital/College facility like those governed by any other management or charitable society or by any forms of memorandum of understanding will not be permitted for the conduct of Paramedical Diploma courses.
2.3	Documents to be submitted.

	<ol style="list-style-type: none"> 1. Clear title deed of the property in favour of the applicant; 2. Resolution of the management to establish the particular institution /course earmarking the area and purpose of running the institution/course concerned; 3. A sketch showing the specific area so earmarked with boundary description, measurements and all details required for identifying the land; 4. A declaration signed by the applicant to the effect that the area so ear marked shall not be used for running any other institution; 5. Audited Balance sheet for the previous 3 (three) years to prove the financial stability 6. Site Plan and Building plan including Academic block , Administrative block , hostels, play ground as approved by Local Self Government 7. Detailed Project Proposal on establishment and running of the Institution/course 8. The institution shall fulfil all the statutory requirements of the State or local authority to establish and run the institution and shall submit the updated certified copies of such permission(s) 9. Required Essentiality Certificate/ permissions from the respective Government / Statutory Council, is obtained. 10. The institution name along with Trust Deed / Society address shall be mentioned in the Essentiality Certificate/ permissions from the respective Government. Period or term of validity of the certificate also should be mentioned in the certificate. 11. Copy of agreement, executed with the government, 12. All the documents to prove the ownership of the land, College, Hospital & other infrastructure facilities shall be available 13. Clearance from Pollution Control Board 14. Under takings <p>Affidavit in Stamp paper shall be submitted to the effect that</p> <ul style="list-style-type: none"> • Stating that they will run the college, make admissions to the course, make appointments of teaching and non teaching staff in terms of Statutory Councils, Central and State Governments. And also to maintain stipulated Teacher Student ratio as well as Student Patient ratio in the institution. • Make available and maintain the infrastructural facilities as required by respective statutory councils, central and state Governments 	
2.4	HOSPITAL	A well established exclusive ophthalmic hospital or amultispecialityhospital with established ophthalmology department of minimum 3 years of existence with 20 beds for ophthalmology and 75% occupancy
2.4.1	Hospital Facility-	The hospital shall be suitably spacious to accommodate all facilities required for the course and as specified in the Regulation of the respective Statutory Council/ MSR for the course. The College and Hospital shall maintain the computerized central registration system for maintaining the records of patients in Out-Patient Department and In-Patient Department, and shall also maintain the Department wise OP and IP records, case records of OP/IP, laboratory and radiological investigation reports, medicines dispensing register, diet register for IPs, duty roster of hospital staff, birth and death certificates, etc. to substantiate the claim of genuine functional of a teaching

	hospital fulfilling the norms. 1. Departments 2. Total Bed 3. Patients 4. Specific requirement for eligibility of the course																																
2.4.2	Major departments needed–ophthalmology																																
2.4.3	Manpower																																
	<table><tr><th>Sl no</th><th>Designation</th><th>No of posts</th><th>Qualification</th></tr><tr><td>1</td><td>Principal/Director Academics</td><td>1</td><td>MBBS + MSOphth+ minimum 10 years teaching experience</td></tr><tr><td>2</td><td>Assistant Professor/Lecturer</td><td>2</td><td>MBBS + MS Ophth</td></tr><tr><td>3</td><td>Lecturer in Optometry/Tutor</td><td>3</td><td>BSc Optometry {from a recognised university} Or DOA with 5 years experience</td></tr><tr><td>4</td><td>Lab assistant</td><td>2</td><td>SSLC + 1 year experience</td></tr><tr><td></td><td>Ophthalmic Asst</td><td>2</td><td>DOA</td></tr><tr><td>5</td><td>Administrative officer</td><td>1</td><td>Graduate with experience in administration for 3 yrs Degree or diploma in Hospital Management preferred</td></tr><tr><td>6</td><td>Assistant</td><td>2</td><td>Graduate with computer knowledge</td></tr></table>	Sl no	Designation	No of posts	Qualification	1	Principal/Director Academics	1	MBBS + MSOphth+ minimum 10 years teaching experience	2	Assistant Professor/Lecturer	2	MBBS + MS Ophth	3	Lecturer in Optometry/Tutor	3	BSc Optometry {from a recognised university} Or DOA with 5 years experience	4	Lab assistant	2	SSLC + 1 year experience		Ophthalmic Asst	2	DOA	5	Administrative officer	1	Graduate with experience in administration for 3 yrs Degree or diploma in Hospital Management preferred	6	Assistant	2	Graduate with computer knowledge
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2.4.4	Equipments 1. Complete set for refraction –trial frame , lenses,prisms.prism box ,prism bar etc 2. Snellen's chart,LogMAR chart 3. Synaptophore 4. Automated Perimeter 5. Streak retinoscope 6. Autorefractometer 7. Tonometer-Schiotz and Applanation 8. AScan ultrasound 9. Keratometer 10. Retinoscopy simulator 11. Minor equipments																																
	2.4.5	Clinical Requirements 1.Ophthalmic ward – bed strength – 20 beds 2. Out patients – 100 patients daily 3.Cataract surgeries[SICS or Phacoemulsification]- 1200per year 4.Other major ophthalmic surgeries[vitreoretinal/glaucoma/cornea/squint] – 150 per year 5. Laser procedures[capsulotomy/iridotomy/retinal]- 500 per year 6.Minor surgical procedures – 3000 per year 7.Speciality clinics in Glaucoma,Retina,Paediatric ophthalmology and strabismus																															
		2.4.6	Laboratories – Clinical laboratory attached to the hospital																														

**3 MINIMUM STANDARDS / REQUIREMENTS (MSR) TO APPLY AND
START THE DOA COURSE**

	Requirement	Eligibility	For starting the course
3.1	Land Area required	Municipality & corporation – 25cents Other -- 50cents	With constructed building and other infra structures
3.2	Single/Multiple	Single	
3.3	Distance from Hospital	Preferably in the same campus or within 10 km	
3.4	Availability of Water	Adequate and safe continuous drinking water facilities must be provided for staffs and students. Also should provide continuous water supply to the Academic block, Hospital, Laboratories, Hostels etc	
3.5	Availability of Electricity	There shall be continuous power supply round the clock with generator facility, provided to the Hospital, College, Hostels and all other infrastructure areas	
3.6	Availability of Public conveyance	Good public transport system should be available at the campus or at a maximum of 500 metre distance from the Institute	
3.7	Waste disposal	Adequate waste disposal measures should be taken as per the Govt norms.	
3.8	Permission of Pollution control board	All the academic institutions and parent hospitals shall take adequate pollution control measures by providing incineration plant, waste disposal measures, sewage water treatment plant, landscaping of the campus etc and submit copy of the Clearance certificate.	
3.9	Play ground	Shall be shared with other courses in the Institute/College	
3.10	Parking area	Adequate parking space shall be made available for parking of institutional vehicles, vehicles of staff, students and patients.	
4	HOSPITAL		
4.1	Total Bed in ophthalmology	50	
4.2	OP	100 per day minimum	
4.3	Departments needed	Ophthalmology	
4.4	Clinical Requirement	1. Ophthalmic ward – bed strength – 50 beds 2. Out patients – 100 patients daily 3. Cataract surgeries[SICS or Phacoemulsificatio]- min 1200per year 4. Other major ophthalmic surgeries[vitreoretinal/glaucoma/cornea/squ	

		int] – 150 per year 5. Laser procedures[capsulotomy/iridotomy/retinal]- 500 per year 6.Minor surgical procedures – 3000 per year 7.Speciality clinics in Glaucoma,Retina,Paediatric ophthalmology and strabismus.	
4.5	Equipments	List of Equipments 1. Complete set for refraction –trial frame , lenses,prisms,prism / box ,prism bar etc 5 2. Snellen’s chart,LogMAR chart 5 3. Synaptophore 3 4. Automated Perimeter 2 5. Streak retinoscope 3 6. Autorefractometer 1 7. Tonometer-Schiotz and Applanation 3 8. A Scan ultrasound 1 9. Keratometer 1 10. Retinoscopy simulator 1 11. Minor equipments	
5	INFRASTRUCTURE FOR THE COLLEGE	Constructed building as per the approved Plan	
5.1	Lecture Halls with teaching aids 30 ft * 20 ft [2 Nos]. Shall be spacious enough to accommodate full batch of students with proper ventilation, lighting system, electricity supply, audio-visual teaching aids, fans and comfortable sitting arrangement preferably theatre type. There should be built in black/green/white boards. There should be a desk/ dais /a big table and a chair for the teacher and racks/cupboards for keeping aids or any other equipment needed for the conduct of classes.		
5.2	Auditorium/Multipurpose hall (Can be shared with other courses conducted in the same institution) Shall be spacious enough to accommodate full strength of students, so that it can be utilized for hosting functions of the college, educational conferences/workshops and examinations. It should have proper stage with green room facilities. It should be well ventilated, have proper lighting system and arrangements for the use of all kinds of basic and advanced audio-visual aids		
5.3	Examination Hall with confidential room. <ul style="list-style-type: none"> Examination hall should meet all requirements as specified by KUHS anticipating up 		

	<p>gradation of/starting of degree programmes and online conduct of exams.</p> <ul style="list-style-type: none"> • Availability of hall / halls of the required size to accommodate the entire Regular and supplementary candidates attending the examination at a time. • The hall/halls shall have sufficient facilities like availability of light, drinking water, fan/air conditioner, attached toilet etc. • Availability of a confidential room attached to the examination hall with two numbers each of desktop computers, printer/digital copier, UPS and Internet connectivity, all in working condition. In addition to this, the room shall also be equipped with generator, fax, and land line phone facilities, all in working condition. (For online transmission of question papers). • Surveillance Camera system of the required specifications in working condition. • Communication Signal jammer of the required specification in working condition <p>This facility may be shared with other courses in the institute.</p>	
5.4	<p>Common Room for Boys & Girls</p> <p>A minimum of 2-3 common rooms should be provided-one for staff, one for male students and one for female students, with adequate seating arrangements, cupboards etc. Toilet and hand washing facilities should be made available in each room.</p>	
5.5	<p>Administrative Block</p> <p>Administrative section of the college shall include Principal's Room, Personal Assistant's Room, Reception, Visitor's lounge, Staff Committee room, Clerks' room, Cash and Accounts section, Record room and Toilets. Separate, furnished office room for administrative staff with telephone, photocopier, computer and internet facility</p>	
5.6	<p>Principal's [or Director Academics] Room</p> <p>There should be a separate office for the Principal/Director with attached toilet and provision for visitor's room. Independent telephone facility is a must for the Principal's office with intercom facility connected/linked to the hospital and hostel and a computer with internet facility. The size of the office should be 30 M².</p>	
5.7	<p>Staff Rooms</p> <p>There should be adequate number of staff rooms/cubicles in proportion to the number of teaching faculty. One staff room/cubicle should accommodate 2 teachers only. The size of the room should be 20 M². Provide separate room for the Heads of the department.</p> <p>There should be separate staff rooms for Non teaching staffs.</p>	
5.8	<p>Central Store</p> <p>A separate store room should be provided to accommodate the equipment and other inventory articles which are required in the laboratories of the college. This room should have the facilities for proper and safe storage of these articles and equipment like cupboards, built-in-shelves, racks, cabinets, furniture items like tables and chairs. This room should be properly lighted and well-ventilated</p>	
5.9	Laboratories/Equi	-clinical laboratory attached to the hospital

	pments/instrumen ts	
--	------------------------	--

5.10	Library (Can share the common library of the institution) Minimum of 100 sq m, well lighted and ventilated preferably Air conditioned. It shall have comfortable seating arrangement with chairs having back rest & arm rest and separate tables. Minimum of 500 Books and Journals related to the core, basic subjects of the courses conducted by the institution shall be available. Sufficient no of computers with multimedia support shall be available for the students. Adequate scanners, printers and photocopier also shall be made available. Separate rooms/ cubicles for the Librarian shall be available If for the doa course alone- Library -1 number -30ft x 20 ft with 500 books of related subjects including journals
5.11	Toilets Separate toilets for boys and girls shall be made available in each floor.
5.12	Garage Garage to accommodate vehicles of the Institute should be maintained within the campus.
5.13	Canteen There should be provision for a canteen for the students, their guests, and all other staff members. Shall be shared with other courses in the institute.

6.1	Teaching Staff (No, Qualification & Experience required shall be specified)			
		No	Qualification/Experience	
6.1.1	Principal[in medical colleges] Or Director Academics	1	For administrative purposes[Principal of Teaching/Paramedical institution can be accepted]	
6.1.2	Director	1	MBBS+MS ophth + minimum 10 years teachingexperience	
6.1.3	Assistant professor /Lecturer	2	MBBS + MS Ophth	
6.1.4	Lecturer in optometry/ Tutor	3	BSc optometry {from a recognised university} Or DOA with 3 years experience	
6.1.5	Lab Assistant	2	SSLC + 1 year experience	
6.1.6	Year wise split up	First Year-As	Second Year -As	Total- Principal -8

		mentioned above	mentioned above	staff for both years
6.2	Technical staff			
6.2.1	Electrician	Can be shared with Hospital		
6.2.2	Plumber			
6.2.3	Mechanic			
6.3	Supporting staff			
6.3.1	Cleaning Staff	Sufficient number to clean the total area		
6.3.2	Security staff	Shall be provided around the clock		
6.3.3	Driver			
7	HOSTELS			
7.1	Separate Hostel for Boys and Girls shall be arranged with the following facilities			
7.2	Minimum 50 sq ft dwelling space per student to be maintained with cot, table, chair, cloth stand and storage facility as Single/Double/Triple Room/Dormitory			
7.3	<ul style="list-style-type: none">• Separate study room, common room, recreation room, visitors room with required furniture and facilities shall be provided• Separate room shall be provided for House keeper, security staff• Adequate no of Bath room,toilets attached to room or common, washing/drying areaetc shall be provided in each floor			
7.4	Dining Room & Kitchen <ul style="list-style-type: none">• Dining hall spacious enough to accommodate the full inmates with wash area, adequate chairs and tables shall be available.• Hygienic Kitchen with all facilities for cooking and serving shall be available.• Arrangement for providing hygienic food incorporating balanced diet shall be ensured			
8	Time & Mode of Application	As per Notification of Govt./ DME for a particular Academic Year		
8.1	Application Fee As fixed by Govt/Statutory Council			
8.2	Processing of Application As specified in Govt Orders issued from time to time			
8.3	Application Forms			
8.3.1	Application for starting new institution/ course	Appendix-A		
8.3.2	Application for Enhancement of Seats	Appendix-B		

Syllabus of Diploma Courses

Conducted by Directorate of Medical Education,

Medical College PO, Thiruvananthapuram

Course Code PMD 04

DIPLOMA IN OPHTHALMIC ASSISTANCE (DOA)

1. COURSE CONTENT

1		
1.1	Title of the course	<u>DIPLOMA IN OPHTHALMIC ASSISTANCE(DOA)</u>
1.2	Aim of the course	To train students to be useful assistants in ophthalmology practice
1.3	Objective of the Course	To train the students to acquire knowledge and skill in testing of glasses ,retinoscopy, identifying common eye diseases, conducting camps and taking active role in prevention of blindness
1.4	Medium of instruction	English
1.5	Duration	The duration of the course shall be 2 years Plus 6 months internship.. The course shall be conducted under the department of Ophthalmology of a Collegiate Hospital. There shall be theory classes along with practical training and resident duty during the course. Duration permitted for successful Completion of the course – 4 years
1.6	Academic eligibility	A pass in the Higher Secondary Examination of the Board of Higher Secondary Education of Kerala or equivalent examinations conducted by any board in India recognized by any of Universities in Kerala with Physics, Chemistry and Biology as optional subjects and a pass with 40% marks in Physics,Chemistry and Biology put together, are eligible. Relaxation of 5% marks will be allowed to SC/STcandidates.
		Indian citizen of Kerala origin is eligible for admission.
		The Candidate should above the age group of 17years.
1.7	Strength/batch	

		Not to exceed ...30..... students per batch
1.8	Reservation	As per existing Government guidelines
1.9	Admission requirement	Selection to the course shall be made by the Director of Medical Education. Selection will be made on merit basis and based on the marks obtained in the qualifying examination. Selection to the management quota in the self-financing institution where the Course is granted and approved by the Government of Kerala, shall be made by the respective management with transparency.
1.10	Subjects of study	
1.10.1	First Year (PART-I)	First Year Training is at the Teaching Centre
	Paper-I	Basic Science in Ophthalmology, Visual optics
	Paper-II	Optics and Refraction , Orthoptic techniques and Ophthalmic equipments
1.10.2	Second year (PART-II)	Mobile Unit-2 months District Hospital-3 months PHC/CHC-1 month Parent Institution- Last 6 months
	Paper-III	Common eye Disorders .Strabismus and Amblyopia
	Paper-IV	Health Education, Community Ophthalmology, Surgical instruments , Operation theatre sterilization
	Internship	6 months internship in the parent institution or any other institution which is approved by the DME. After successful completion of the course.(non stipendry)

2. DISTRIBUTION OF HOURS

2.1 Part-1: Paper-1 Basic Science in Ophthalmology & Visual Optics			2.2 Part-1: Paper-II Optics and Refraction, Orthoptic techniques and Ophthalmic Equipments	
A		Hrs		Hrs
1	Anatomy	10		
2	Physiology of Vision	10	Optical system of normal and abnormal eyes:	30
3	Optics	5		
4	Microbiology	5	Orthoptic techniques	10
5	Pharmacology	10	Ophthalmic equipments	25
6	Vision testing	8		
7	Colour vision	2		
8	Subjective testing of glasses	5		
9	Retinoscopy	10		
	TOTAL	65		65
	GRAND TOTAL			

Part II

2.4 Part-II: Paper-III Common eye Disorders, Strabismus			2.5 Part-II: Paper-IV Health Education, Community Ophthalmology, surgical instruments, OT sterilization	
1	Common eye diseases	45	Community Ophthalmology	10
2	Strabismus and amblyopia	15	Organization of camps in rural areas	5
3			Eye banking	7
4			Rehabilitation of the blind and LVA training	5
5			Basics of Theatre sterilization and Surgical Instruments:	8
	TOTAL	60		35
	GRAND TOTAL			

3. DETAILED SYLLABUS

3.1 PART I – PAPER I Basic Science in Ophthalmology & Visual Optics

Section A :

1. ANATOMY

- Anatomy of the eye ball, extra ocular muscles, orbit, lids and lacrimal apparatus.
- Names of cranial nerves- 2,3,4,5,6,7

2. PHYSIOLOGY OF VISION

- Visual acuity, colour vision, aqueous humor formation and circulation, intraocular pressure, ocular movements and binocular single vision, accommodation and convergence

3. OPTICS

- Laws of reflection, refraction, spherical and cylindrical lenses, prisms- nomenclature

4. MICROBIOLOGY

- Various organisms responsible for ocular diseases- Bacteria, fungi, viruses, parasites

5. PHARMACOLOGY

Ophthalmic drugs

- cycloplegics- mechanism of action, indications, contraindications, adverse effects

- ii) common antibiotics –
Fluoroquinolones, aminoglycosides, tetracyclines, antifungals, antivirals-
uses
- iii) Steroids-uses, contraindications, adverse effects
- iv) NSAIDs- uses
- iv) Common Anti glaucoma medicines -Topical and systemic AGM

6. Vision testing: Principles of vision testing, methods of vision testing.

- i) Distant vision
- ii) Near vision
- iii) Colour vision
- iv) Retinoscopy
- v) Subjective testing of glasses

PART I-PAPER II Optics and Refraction, orthoptic techniques and Ophthalmic Equipments

1. Optical system of normal and abnormal eyes:

Refractive errors – myopia, hypermetropia, astigmatism, presbyopia, aphakia
Contact lenses and fitting, Intraocular lenses,
Measurement of IPD, Filling adjustments of spectacles,
Decentering, Transposition, checking of glasses, lens surfacing
Accommodation and convergence: measurements, anomalies
Convergence exercises

2. Ophthalmic equipments: Trial set, Retinoscope, Keratometer,
Placidosdisc, Tonometer, Maddox rod, Maddox wing, synoptophore,
Perimeter and charts, Hess screen, RAF rule

3. Orthoptic techniques

PART II- PAPER III Common eye Disorders, Strabismus

Common eye diseases:

- i) Diseases of Conjunctiva—Infective Conjunctivitis, non-infective conjunctivitis, Ophthalmia nodosum, Ophthalmia neonatorum, Pterygium
- ii) Diseases of Cornea—Infective keratitis causative organisms, clinical features of bacterial and fungal corneal ulcers, treatment, keratoconus, Vitamin A deficiency, refractive surgeries, keratoplasty

- iii) Glaucoma-Definition of glaucoma. Primary open angle glaucoma ,Primary angle closure glaucoma,Measurement of IOP,field charting,Tonometry-types of Tonometers,Goldmann applanation tonometer,Schiotz tonometer
- iv) Diseases of uvea—Anterior uveitis
- iv) Diseases of lens—Cataract ,management of cataract, Dislocation and subluxation of lens
- v) Diseases of retina— Diabetic retinopathy – ETDRS classification,Hypertensive retinopathy, Retinal detachment - definition,types,causes,CRVO/CRAO- causes, Vitreous haemorrhage - causes,Retinoblastoma,Retinopathy of prematurity –Definition, screening of pre term babies. Leucocoria in children- Causes
- vi) Diseases of optic nerve—Enumerate the causes of disc edema, Enumerate the causes of optic atrophy
- vii) Diseases of the orbit– Proptosis -causes
- ix) Diseases of lids and lacrimal apparatus—Inflammation of the glands of the lids, blepharitis,anomalies in the position of lids and lashes- Trichiasis,Entropion- definition and types, Ectropion- definition and types,Symblepharon,ankyloblepharon,blepharophimosis,lagophthalmos,Ptosis – Definition and types, Dry eye,dacryocystitis,Congenital NLDO,Epiphora
- x) Injuries- Mechanical – Types,Effects of blunt trauma in eye,Open globe injuries.chemical injuries -Types,First aid

Strabismus and amblyopia- Concomitant strabismus, Measurement of angle of deviation, Vision assessment in infants and children, Amblyopia- Definition,types,management

3.4 PART II – PAPER IV -Community Ophthalmology and health education,Basics of Theatre sterilisation and Surgical Instruments

- 1.Community Ophthalmology:Malnutrition and the eye ,glaucoma screening , early detection of squint and refractive errors i school children ,detection of cataract.,NP
- 2.Organisation of camps in rural areas:
- 3.Rehabilitation of the blind and LVA training
- 4.:Basics of operation theatre sterilisation ,care and sterilisation of instruments,swab and eye pads
- 5, Eyebanking
- 6.Common surgical instruments

4. SCHEME OF TEACHING AND CLINICAL TRAINING

First Year :

Second Year:

Year	Subject	No of Hrs
First Yr	PART-I	
	Theory	
	a. Paper I topics	65
	b. Paper II topics	65
	c. Paper III topics	10
	d. Paper IV topics	10
	Practical & Posting	
	a. Parent institution	1000
	TOTAL HRS	1150
Second Yr	PART-II	
	Theory	
	a. Paper III topics	50
	b. Paper IV topics	25
	Practical & Posting	
	a. District Hospital PHC mobile Unit	500
	b. Parent Hospital	500
	TOTAL HRS	1075
	GRAND TOTAL	2225

- 1.1 Records
- 1.2 Log Book
- 1.3 Seminars

5 **TEACHING /LEARNING AIDS**

- 5.1 Books / reference books prescribed

5.2 Models/Charts:

6 EXAMINATION

6.1 Scheme of internal assessment –Regular internal assessment through written & practical exam shall be conducted. Minimum of 3 internal assessment & one model exam are to be conducted & average of these marks are to be tabulated and presented to the DME before the final examination.

6.2 Final examination : Theory & Practical

6.2.1 The Authority to conduct the examination:

The Director of Medical Education, Government of Kerala

6.2.2 Frequency

Regular examination shall be conducted at the end of the 1st and 2nd years.

Supplementary examination shall be conducted 6 months after the regular examination.

6.2.3 Eligibility

- a. Minimum of 80% attendance in theory & practical is required to appear for the final exam.
- b. Certificate of satisfactory completion of the course by the Course Director or Head of Department/Institution.

6.2.4 Schedule of Exam

- a. Regular examination shall be conducted at the end of the academic year which includes theory, practical & Viva voce
- b. Total 4 Papers (2 papers in the 1st year and 2 papers in the 2nd year)
- c. Each paper shall be of duration of 3 hours with total marks of 100 each. Each paper shall have 2 sections- Section A & Section B.

d. Practical examination

First year exam- 100 marks practicals – Retinoscopy [25marks], Retinoscopy problems [25marks], Viva [25marks], Instruments [25marks]

Second year exam-100 marks practicals– Retinoscopy problems [25], cataract case [25], squint [25]
Instruments [25]

50 marks-viva

6.3 Examiners

Faculty with post PG teaching experience of minimum of 3 years in the concerned course/subject is eligible to be an examiner

6.4 Pass Criteria

Minimum of 45% of marks in each theory paper with a minimum of 50% of marks in the total theory paper and a minimum of 40% of marks in the oral/practical exam with a minimum of 50% aggregate marks of the grand total (Total theory, practical and internal assessment) Candidates who scores highest mark in the grand total (Theory, practical and internal assessment) the regular examination shall be awarded the first Rank.

First year examination	-	200 out of 400.
Second year examination	-	250 out of 500

6.5 First class/Distinction/Rank

Candidates scoring not less than 65% & above shall be awarded first class. Candidates scoring 75% & above shall be awarded distinction. Candidates who scores highest mark in the grand total (Theory, practical and internal assessment) shall be awarded the first Rank.

Any candidate who requires revaluation shall submit the request to do so within 14 days of the official declaration of the result.

6.6 Model Mark Sheet

7 MODEL MARK LIST

First year exam – 400 marks

Internal assessment	-100
Part 1 Paper 1	-100
Part 1 Paper 2	- 100
Practicals	-100

Second year exam – 500 marks

Internal assessment	[150]
District hospital	-50
PHC	-50
Mobile unit	-50
Part 2 paper 3	-100
Part 2 paper 4	-100
Practicals	- 100
Viva	-50

Grand total - 900 marks

DIPLOMA IN OPHTHALMIC ASSISTANT COURSE EXAMINATION

Time- 3 hrs

Max.marks :100

PART 1 PAPER 1

BASIC SCIENCE IN OPHTHALMOLOGY AND VISUAL OPTICS

[Answer Section A & B separately and draw diagrams wherever necessary]

SECTION A

1. Define astigmatism. What are the different types of Astigmatism How will you correct astigmatism?
[2+4+4=10]
2. Write Short notes on
[4x5=20]

- a) Convex lens
- b) Trial frame
- c) Worths four dot test
- d) Uses of prisms
- e) Aphakia

3. Write very briefly on

[2x5=10]

- a) Cycloplegic drugs
- b) Refractive Index of cornea and lens
- c) Name few bacteria causing keratitis
- d) Tests for Colour Vision
- e) Antiglaucoma drugs

4. Answer to the point

[10x1=10]

- a) Refractive error seen in advanced Pterygium
- b) A scan is used to measure-----
- c) One antibiotic used in corneal ulcer treatment
- d) Name one fungus causing corneal ulcer
- e) Instrument which is used to view angle of anterior chamber
- f) Expansion of OCT
- g) One cause for sudden painless loss of vision
- h) Name a material used in intraocular lens manufacture
- i) Hess screen is used in -----
- j) One cause for night blindness

SECTION B

1. What is Presbyopia ? Describe the pathophysiology of Presbyopia. Basic principles to correct presbyopia

[2+4+4=10]

2. Write Short notes on

[4x5=20]

- a) Astigmatism
- b) LASERs in ophthalmology
- c) Maddox wing
- d) Mydriatics
- e) Accommodation

3. Write very briefly on

[2x5=10]

- a) Nerve supply of Medial Rectus and Lateral Rectus muscles
- b) Causes for diplopia
- c) 2 measurements taken for Intra ocular lens power calculation and instruments used for them
- d) Progressive lenses
- e) Aqueous Humor

4. Answer to the point

[10x1=10]

- a) Dye which is used to stain corneal epithelial defect
- b) Culture medium for fungus
- c) Contact lens which is used to correct astigmatism
- d) Name one refractive surgery
- e) One problem in spectacle correction of Aphakia
- f) Peripheral retina is visualized by -----
- g) In myopia image is formed ----- retina
- h) A preservative used in eye drops
- i) One cause for acute red eye
- j) Expansion of LASIK

**DIPLOMA IN OPHTHALMIC ASSISTANT COURSE
EXAMINATION**

Time- 3 hrs
Max.marks :100

PART 1 PAPER 2

**OPTICS AND REFRACTION AND OPHTHALMIC
EQUIPMENTS**

[Answer Section A & B separately and draw diagrams wherever necessary]

SECTION A

1. Define Binocular single vision. What are the grades of BSV ?Mention different tests for BSV

[2+3+5]

2. Write Short notes on

[4x5=20]

- a) Trial lenses
- b) Post mydriatic test
- c) RAF ruler
- d) Dynamic retinoscopy
- e) Interpupillary distance

3. Write very briefly on

[2x5=10]

- a) Field defects in glaucoma
- b) Causes of Irregular astigmatism
- c) Methods to Correct Unilateral Aphakia
- d) Maddox wing
- e) Cylindrical lenses

4. Answer to the point

[10x1=10]

- a) Angle of anterior chamber is seen with -----
- b) Radius of curvature of cornea is measured by-----
- c) Trial frame has ----- compartments
- d) Toric lenses are used to correct-----
- e) Normal AC/A ratio is-----
- f) one method to test visual acuity in preschool children
- g) Formula used to calculate IOL power
- h) Squint which develop in a blind eye in adult is usually-----
- i) Normal Refractive power of cornea is -----
- j) Pin cushion distortion is seen in-----

SECTION B

1. Discuss different types of Tonometers. What is the advantage of Applanation tonometer over indentation tonometer marks]

[10

2. Write Short notes on

[4x5=20]

- a) Sturm's conoid
- b) Optics of Aphakia
- c) Keratometry
- d) Uses of lasers in ophthalmology
- e) Trial set

3. Write very briefly on

[2x5=10]

- a) Uses of Synaptophore
- b) Dynamic retinoscopy
- c) Interpupillary distance
- d) Schiottz tonometer
- e) Progressive glasses

4. Answer to the point

[10x1=10]

- a) Normal axial length of eyeball is
- b) Example of dynamic perimetry
- c) RAF ruler is used for-----
- d) Corneal thickness is measured by -----
- e) A condition where we get faint retinoscopic reflex
- f) Refractive index of crystalline lens is
- g) Near vision is tested-----
- h) Normal intraocular pressure is-----
- i) Scissor reflex is seen in -----
- j) Rigid contact lens is used in-----

DIPLOMA IN OPHTHALMIC ASSISTANT COURSE EXAMINATION

Time- 3 hrs

Max.marks :100

PART 2 PAPER1

HEALTH EDUCATION, COMMUNITY OPHTHALMOLOGY AND COMMON EYE DISORDERS

[Answer Section A & B separately and draw diagrams wherever necessary]

SECTION A

1. Define corneal blindness and its prevention. Discuss about Eye banking

[10 marks]

2. Write Short notes on

[4x5=20]

- a) Pterygium
- b) Low Vision aids
- c) Keratoconus
- d) Signs and symptoms of iridocyclitis
- e) School screening programme

3. Write very briefly on

[2x5=10]

- a) 2 signs of Vitamin A deficiency in eye
- b) 4 Common causes for red eye
- c) 4 Clinical features of Acute congestive glaucoma
- d) Vernal conjunctivitis

e) Low vision aids

4. Answer to the point

[10x1=10]

a) One cause for sudden loss of vision

b) One cause for epiphora in infant

c) One cause for presenile cataract

d) Drooping of eyelid is known as -----

e) Rosette cataract is seen in -----

f) One cause for uveitis

g) Dendritic keratitis is seen in -----

h) Misdirection of eye lashes -----

i) Protrusion of eye ball is known as -----

j) One complication of hypermature cataract

SECTION B

1. What is conjunctivitis ? Different types of conjunctivitis and various methods to prevent it

[10 marks]

2. Write Short notes on

[4x5=20]

a) Intra ocular lens

b) Entropion

c) School screening camps

d) Rehabilitation of blind

e) Convergent Squint

3. Write very briefly on

[2x5=10]

a) 4 Visual field abnormalities in glaucoma

b) 2 clinical features of Trachoma

c) 2 goals of Vision 2020

d) First aid for chemical injury

e) 4 causes for Amblyopia

4. Answer to the point

[10x1=10]

a) Brown colored cataract is known as -----

b) Very faint corneal opacity is known as -----

c) One cause for circumferential corneal congestion

d) Most accurate instrument to test field of vision is -----

e) Most accurate method to test intra ocular pressure is -----

- f) Bitot's spot is seen in-----
- g) One cause for hypopyon corneal ulcer
- h) Capsulotomy is done by -----laser
- i) One cause for congenital cataract
- j) Glaucoma seen in newborn is -----

DIPLOMA IN OPHTHALMIC ASSISTANT COURSE EXAMINATION

Time- 3 hrs
Max.marks :100

PART 2 PAPER2

OPHTHALMIC TECHNIQUES OPTICS AND REFRACTION

[Answer Section A & B separately and draw diagrams wherever necessary]

SECTION A

1. Define sterilization. Briefly discuss about the sterilization of ophthalmic instruments and theatre

[10

marks]

2. Write Short notes on

[4x5=20]

- a) Automated refraction
- b) Lens decentration
- c) Corneal preservation
- d) Chemical sterilization
- e) Transposition

3. Write very briefly on

[2x5=10]

- a) 2 Cover tests
- b) 2 Malingering tests
- c) Use of Progressive lenses
- d) 2 Uses of RAF ruler
- e) 2 complications of Pathological myopia

4. Answer to the point

[10x1=10]

- a) Rigid contact lens is made of-----
- b) Refractive error in Aphakia is-----
- c) Patching is treatment for-----
- d) In exotropia -----prism is used to measure
- e) Intraocular lens used in Phacoemulsification
- f) Name 2 oblique ocular muscles
- h) -----goggle is used in diplopia charting

- i) Actions of Atropine
- j) IPD can be measured by-----

SECTION B

1. Define the methods of retinoscopy. What are the types of retinoscopes . Mention the cycloplegics used in different age groups

[10 marks]

2. Write Short notes on

[4x5=20]

- a) Irregular astigmatism
- b) Amblyopia
- c) Applanation tonometry
- d) Multifocal glasses
- e) FRIEND test

3. Write very briefly on

[2x5=10]

- a) 2 Uses of contact lens
- b) Advantages of Automated refraction
- c) 2 complications of Lens decentration
- d) 2 methods of Corneal preservation
- e) 2 uses of Jacksons cross cylinder

4. Answer to the point

[10x1=10]

- a) In exophoria ----- lenses can be used for treatment options
- b) Angle of primary deviation is equal to angle of secondary deviation in -----
- c) Laser treatment done for correction of refractive errors is -----
- d) Accomodative esotropia is treated by -----
- e) Action of Atropine
- f) Magnified image is seen when seen through ----- lens
- g) Vertex power of spectacle is measured by -----
- h) Power of intra ocular lens for an emmetropic person is -----
- i) Colour of pupil in Aphakia is -----
- j) The size of pinhole is -----

Syllabus of Diploma Courses

Conducted by Directorate of Medical Education,

Medical College PO, Thiruvananthapuram

Course Code
PMD 04

DIPLOMA IN OPHTHALMIC ASSISTANCE (DOA)

1. COURSE CONTENT

1		
1.1	Title of the course	<u>DIPLOMA IN OPHTHALMIC ASSISTANCE(DOA)</u>
1.2	Aim of the course	To train students to be useful assistants in ophthalmology practice
1.3	Objective of the Course	To train the students to acquire knowledge and skill in testing of glasses ,retinoscopy, identifying common eye diseases, conducting camps and taking active role in prevention of blindness
1.4	Medium of instruction	English
1.5	Duration	The duration of the course shall be 2 years Plus 6 months internship.. The course shall be conducted under the department of Ophthalmology of a Collegiate Hospital. There shall be theory classes along with practical training and resident duty during the course. Duration permitted for successful Completion of the course – 4 years
1.6	Academic eligibility	A pass in the Higher Secondary Examination of the Board of Higher Secondary Education of Kerala or equivalent examinations conducted by any board in India recognized by any of Universities in Kerala with Physics, Chemistry and Biology as optional subjects and a pass with 40% marks in Physics, Chemistry and Biology put together, are eligible. Relaxation of 5% marks will be allowed to SC/ST candidates.
		Indian citizen of Kerala origin is eligible for admission.
		The Candidate should above the age group of 17 years.
1.7	Strength/batch	

		Not to exceed ...30..... students per batch
1.8	Reservation	As per existing Government guidelines
1.9	Admission requirement	Selection to the course shall be made by the Director of Medical Education. Selection will be made on merit basis and based on the marks obtained in the qualifying examination. Selection to the management quota in the self-financing institution where the Course is granted and approved by the Government of Kerala, shall be made by the respective management with transparency.
1.10	Subjects of study	
1.10.1	First Year (PART-I)	First Year Training is at the Teaching Centre
	Paper-I	Basic Science in Ophthalmology, Visual optics
	Paper-II	Optics and Refraction , Orthoptic techniques and Ophthalmic equipments
1.10.2	Second year (PART-II)	Mobile Unit-2 months District Hospital-3 months PHC/CHC-1 month Parent Institution- Last 6 months
	Paper-III	Common eye Disorders .Strabismus and Amblyopia
	Paper-IV	Health Education, Community Ophthalmology, Surgical instruments , Operation theatre sterilization
	Internship	6 months internship in the parent institution or any other institution which is approved by the DME. After successful completion of the course.(non stipendry)

2. DISTRIBUTION OF HOURS

2.1 Part-1: Paper-I Basic Science in Ophthalmology & Visual Optics			2.2 Part-1: Paper-II Optics and Refraction, Orthoptic techniques and Ophthalmic Equipments	
A		Hrs		Hrs
1	Anatomy	10		
2	Physiology of Vision	10	Optical system of normal and abnormal eyes:	30
3	Optics	5		
4	Microbiology	5	Orthoptic techniques	10
5	Pharmacology	10	Ophthalmic equipments	25
6	Vision testing	8		
7	Colour vision	2		
8	Subjective testing of glasses	5		
9	Retinoscopy	10		
	TOTAL	65		65
	GRAND TOTAL			

Part II

2.4 Part-II: Paper-III Common eye Disorders, Strabismus			2.5 Part-II: Paper-IV Health Education, Community Ophthalmology, surgical instruments, OT sterilization	
1	Common eye diseases	45	Community Ophthalmology	10
2	Strabismus and amblyopia	15	Organization of camps in rural areas	5
3			Eye banking	7
4			Rehabilitation of the blind and LVA training	5
5			Basics of Theatre sterilization and Surgical Instruments:	8
	TOTAL	60		35
	GRAND TOTAL			

3. DETAILED SYLLABUS

3.1 PART I – PAPER I Basic Science in Ophthalmology & Visual Optics

Section A :

1. ANATOMY

- Anatomy of the eye ball, extra ocular muscles, orbit, lids and lacrimal apparatus.
- Names of cranial nerves- 2,3,4,5,6,7

2. PHYSIOLOGY OF VISION

- Visual acuity, colour vision, aqueous humor formation and circulation, intraocular pressure, ocular movements and binocular single vision, accommodation and convergence

3. OPTICS

- Laws of reflection, refraction, spherical and cylindrical lenses, prisms- nomenclature

4. MICROBIOLOGY

- Various organisms responsible for ocular diseases- Bacteria, fungi, viruses, parasites

5. PHARMACOLOGY

Ophthalmic drugs

- cycloplegics- mechanism of action, indications, contraindications, adverse effects

- ii) common antibiotics –
Fluoroquinolones, aminoglycosides, tetracyclines, antifungals, antivirals-
uses
- iii) Steroids-uses ,contraindications, adverse effects
- Iv) NSAIDs- uses
- iv) Common Anti glaucoma medicines -Topical and systemic AGM

6. Vision testing: Principles of vision testing, methods of vision testing.

- i) Distant vision
- ii) Near vision
- iii) Colour vision
- iv) Retinoscopy
- v) Subjective testing of glasses

PART I-PAPER II Optics and Refraction ,orthoptic techniques and Ophthalmic Equipments

1. Optical system of normal and abnormal eyes:

Refractive errors – myopia, hypermetropia, astigmatism, presbyopia, aphakia
Contact lenses and fitting ,Intraocular lenses,
Measurement of IPD ,Filling adjustments of spectacles,
Decentering, Transposition, checking of glasses, lens surfacing
Accommodation and convergence: measurements, anomalies
Convergence exercises

2.Ophthalmic equipments: Trial set, Retinoscope, Keratometer,
Placidosdisc, Tonometer, Maddoxrod, Maddox wing, synoptophore,
Perimeter and charts ,Hess screen, RAF rule

3.Orthoptic techniques

PART II- PAPER III Common eye Disorders , Strabismus

Common eye diseases:

- i) Diseases of Conjunctiva—Infective Conjunctivitis, non-infective conjunctivitis, Ophthalmia nodosum, Ophthalmia neonatorum, Pterygium
- ii) Diseases of Cornea—Infective keratitis causative organisms, clinical features of bacterial and fungal corneal ulcers, treatment, keratoconus, Vitamin A deficiency, refractive surgeries, keratoplasty

- iii) Glaucoma-Definition of glaucoma. Primary open angle glaucoma ,Primary angle closure glaucoma,Measurement of IOP,field charting,Tonometry-types of Tonometers,Goldmann applanation tonometer,Schiotz tonometer
- iv) Diseases of uvea—Anterior uveitis
- iv) Diseases of lens—Cataract ,management of cataract, Dislocation and subluxation of lens
- v) Diseases of retina— Diabetic retinopathy – ETDRS classification,Hypertensive retinopathy, Retinal detachment - definition,types,causes,CRVO/CRAO- causes, Vitreous haemorrhage - causes,Retinoblastoma,Retinopathy of prematurity –Definition, screening of pre term babies. Leucocoria in children- Causes
- vi) Diseases of optic nerve—Enumerate the causes of disc edema, Enumerate the causes of optic atrophy
- vii) Diseases of the orbit– Proptosis -causes
- ix) Diseases of lids and lacrimal apparatus—Inflammation of the glands of the lids, blepharitis,anomalies in the position of lids and lashes- Trichiasis,Entropion- definition and types, Ectropion- definition and types,Symblepharon.ankyloblepharon,blepharophimosis,lagophthalmos,Ptosis – Definition and types, Dry eye,dacryocystitis,Congenital NLDO,Epiphora
- x) Injuries- Mechanical – Types,Effects of blunt trauma in eye,Open globe injuries.chemical injuries -Types,First aid

Strabismus and amblyopia- Concomitant strabismus, Measurement of angle of deviation, Vision assessment in infants and children, Amblyopia- Definition,types,management

3.4 PART II – PAPER IV -Community Ophthalmology and health education,Basics of Theatre sterilisation and Surgical Instruments

1.Community Ophthalmology:Malnutrition and the eye ,glaucoma screening , early detection of squint and refractive errors i school children ,detection of cataract.,NP

2.Organisation of camps in rural areas:

3.Rehabilitation of the blind and LVA training

4.:Basics of operation theatre sterilisation ,care and sterilisation of instruments,swab and eye pads

5, Eyebanking

6.Common surgical instruments

4. SCHEME OF TEACHING AND CLINICAL TRAINING

First Year :

Second Year:

Year	Subject	No of Hrs
First Yr	PART-I	
	Theory	
	a. Paper I topics	65
	b. Paper II topics	65
	c. Paper III topics	10
	d. Paper IV topics	10
	Practical & Posting	
	a. Parent institution	1000
	TOTAL HRS	1150
Second Yr	PART-II	
	Theory	
	a. Paper III topics	50
	b. Paper IV topics	25
	Practical & Posting	
	a. District Hospital PHC mobile Unit	500
	b. Parent Hospital	500
	TOTAL HRS	1075
	GRAND TOTAL	2225

- 1.1 Records
- 1.2 Log Book
- 1.3 Seminars

5 TEACHING /LEARNING AIDS

5.1 Books / reference books prescribed

6 EXAMINATION

6.1 Scheme of internal assessment –Regular internal assessment through written & practical exam shall be conducted. Minimum of 3 internal assessment & one model exam are to be conducted & average of these marks are to be tabulated and presented to the DME before the final examination.

6.2 Final examination : Theory & Practical

6.2.1 The Authority to conduct the examination:

The Director of Medical Education, Government of Kerala

6.2.2 Frequency

Regular examination shall be conducted at the end of the 1st and 2nd years.

Supplementary examination shall be conducted 6 months after the regular examination.

6.2.3 Eligibility

- a. Minimum of 80% attendance in theory & practical is required to appear for the final exam.
- b. Certificate of satisfactory completion of the course by the Course Director or Head of Department/Institution.

6.2.4 Schedule of Exam

- a. Regular examination shall be conducted at the end of the academic year which includes theory, practical & Viva voce
- b. Total 4 Papers (2 papers in the 1st year and 2 papers in the 2nd year)
- c. Each paper shall be of duration of 3 hours with total marks of 100 each.
Each paper shall have 2 sections- Section A & Section B.
- d. **Practical examination**
First year exam- 100 marks practicals – Retinoscopy[25marks], Retinoscopy problems [25marks], Viva [25marks], Instruments [25marks]
Second year exam-100 marks practicals– Retinoscopy problems [25], cataract case[25], squint [25]
Instruments [25]

50 marks-viva

6.3 Examiners

Faculty with post PG teaching experience of minimum of 3 years in the concerned course/subject is eligible to be an examiner

6.4 Pass Criteria

Minimum of 45% of marks in each theory paper with a minimum of 50% of marks in the total theory paper and a minimum of 40% of marks in the oral/practical exam with a minimum of 50% aggregate marks of the grand total (Total theory, practical and internal assessment) Candidates who scores highest mark in the grand total (Theory, practical and internal assessment) the regular examination shall be awarded the first Rank.

First year examination	-	200 out of 400.
Second year examination	-	250 out of 500

6.5 First class/Distinction/Rank

Candidates scoring not less than 65% & above shall be awarded first class. Candidates scoring 75% & above shall be awarded distinction. Candidates who scores highest mark in the grand total (Theory, practical and internal assessment) shall be awarded the first Rank.

Any candidate who requires revaluation shall submit the request to do so within 14 days of the official declaration of the result.

6.6 Model Mark Sheet

7 MODEL MARK LIST

First year exam – 400 marks

Internal assessment	-100
Part 1 Paper 1	-100
Part 1 Paper 2	- 100
Practicals	-100

Second year exam – 500 marks

Internal assessment	[150]
District hospital	-50
PHC	-50
Mobile unit	-50
Part 2 paper 3	-100
Part 2 paper 4	-100
Practicals	- 100
Viva	-50

Grand total - 900 marks

DIPLOMA IN OPHTHALMIC ASSISTANT COURSE EXAMINATION

Time- 3 hrs

Max.marks :100

PART 1 PAPER 1

BASIC SCIENCE IN OPHTHALMOLOGY AND VISUAL OPTICS

[Answer Section A & B separately and draw diagrams wherever necessary]

SECTION A

1. Define astigmatism. What are the different types of Astigmatism How will you correct astigmatism?

[2+4+4=10]

2. Write Short notes on

[4x5=20]

- a) Convex lens
- b) Trial frame
- c) Worths four dot test
- d) Uses of prisms
- e) Aphakia

3. Write very briefly on

[2x5=10]

- a) Cycloplegic drugs
- b) Refractive Index of cornea and lens
- c) Name few bacteria causing keratitis
- d) Tests for Colour Vision
- e) Antiglaucoma drugs

4. Answer to the point

[10x1=10]

- a) Refractive error seen in advanced Pterygium
- b) A scan is used to measure-----
- c) One antibiotic used in corneal ulcer treatment
- d) Name one fungus causing corneal ulcer
- e) Instrument which is used to view angle of anterior chamber
- f) Expansion of OCT
- g) One cause for sudden painless loss of vision
- h) Name a material used in intraocular lens manufacture
- i) Hess screen is used in -----
- j) One cause for night blindness

SECTION B

1. What is Presbyopia ? Describe the pathophysiology of Presbyopia. Basic principles to correct presbyopia

[2+4+4=10]

2. Write Short notes on

[4x5=20]

- a) Astigmatism
- b) LASERs in ophthalmology
- c) Maddox wing
- d) Mydriatics
- e) Accommodation

3. Write very briefly on

[2x5=10]

- a) Nerve supply of Medial Rectus and Lateral Rectus muscles
- b) Causes for diplopia
- c) 2 measurements taken for Intra ocular lens power calculation and instruments used for them
- d) Progressive lenses
- e) Aqueous Humor

4. Answer to the point

[10x1=10]

- a) Dye which is used to stain corneal epithelial defect
- b) Culture medium for fungus
- c) Contact lens which is used to correct astigmatism
- d) Name one refractive surgery
- e) One problem in spectacle correction of Aphakia
- f) Peripheral retina is visualized by -----
- g) In myopia image is formed ----- retina
- h) A preservative used in eye drops
- i) One cause for acute red eye
- j) Expansion of LASIK

**DIPLOMA IN OPHTHALMIC ASSISTANT COURSE
EXAMINATION**

Time- 3 hrs

Max.marks :100

PART 1 PAPER 2

**OPTICS AND REFRACTION AND OPHTHALMIC
EQUIPMENTS**

[Answer Section A & B separately and draw diagrams wherever necessary]

SECTION A

1. Define Binocular single vision. What are the grades of BSV ?Mention different tests for BSV

[2+3+5]

2. Write Short notes on

[4x5=20]

- a) Trial lenses
- b) Post mydriatic test
- c) RAF ruler
- d) Dynamic retinoscopy
- e) Interpupillary distance

3. Write very briefly on

[2x5=10]

- a) Field defects in glaucoma
- b) Causes of Irregular astigmatism
- c) Methods to Correct Unilateral Aphakia
- d) Maddox wing
- e) Cylindrical lenses

4. Answer to the point

[10x1=10]

- a) Angle of anterior chamber is seen with -----
- b) Radius of curvature of cornea is measured by-----
- c) Trial frame has ----- compartments
- d) Toric lenses are used to correct-----
- e) Normal AC/A ratio is-----
- f) one method to test visual acuity in preschool children
- g) Formula used to calculate IOL power
- h) Squint which develop in a blind eye in adult is usually-----
- i) Normal Refractive power of cornea is -----
- j) Pin cushion distortion is seen in-----

SECTION B

1. Discuss different types of Tonometers. What is the advantage of Applanation tonometer over indentation tonometer marks]

[10]

2. Write Short notes on

[4x5=20]

- a) Sturm's conoid
- b) Optics of Aphakia
- c) Keratometry
- d) Uses of lasers in ophthalmology
- e) Trial set

3. Write very briefly on

[2x5=10]

- a) Uses of Synaptophore
- b) Dynamic retinoscopy
- c) Interpupillary distance
- d) Schiotz tonometer
- e) Progressive glasses

4. Answer to the point

[10x1=10]

- a) Normal axial length of eyeball is
- b) Example of dynamic perimetry
- c) RAF ruler is used for-----
- d) Corneal thickness is measured by -----
- e) A condition where we get faint retinoscopic reflex
- f) Refractive index of crystalline lens is
- g) Near vision is tested-----
- h) Normal intraocular pressure is-----
- i) Scissor reflex is seen in -----
- j) Rigid contact lens is used in-----

DIPLOMA IN OPHTHALMIC ASSISTANT COURSE EXAMINATION

Time- 3 hrs

Max.marks :100

PART 2 PAPER I

HEALTH EDUCATION, COMMUNITY OPHTHALMOLOGY AND COMMON EYE DISORDERS

[Answer Section A & B separately and draw diagrams wherever necessary]

SECTION A

1. Define corneal blindness and its prevention. Discuss about Eye banking

[10 marks]

2. Write Short notes on

[4x5=20]

- a) Pterygium
- b) Low Vision aids
- c) Keratoconus
- d) Signs and symptoms of iridocyclitis
- e) School screening programme

3. Write very briefly on

[2x5=10]

- a) 2 signs of Vitamin A deficiency in eye
- b) 4 Common causes for red eye
- c) 4 Clinical features of Acute congestive glaucoma
- d) Vernal conjunctivitis

e) Low vision aids

4. Answer to the point

[10x1=10]

a) One cause for sudden loss of vision

b) One cause for epiphora in infant

c) One cause for presenile cataract

d) Drooping of eyelid is known as -----

e) Rosette cataract is seen in -----

f) One cause for uveitis

g) Dendritic keratitis is seen in -----

h) Misdirection of eye lashes -----

i) Protrusion of eye ball is known as -----

j) One complication of hypermature cataract

SECTION B

1. What is conjunctivitis ? Different types of conjunctivitis and various methods to prevent it

[10 marks]

2. Write Short notes on

[4x5=20]

a) Intra ocular lens

b) Entropion

c) School screening camps

d) Rehabilitation of blind

e) Convergent Squint

3. Write very briefly on

[2x5=10]

a) 4 Visual field abnormalities in glaucoma

b) 2 clinical features of Trachoma

c) 2 goals of Vision 2020

d) First aid for chemical injury

e) 4 causes for Amblyopia

4. Answer to the point

[10x1=10]

a) Brown colored cataract is known as -----

b) Very faint corneal opacity is known as -----

c) One cause for circum corneal congestion

d) Most accurate instrument to test field of vision is -----

e) Most accurate method to test intra ocular pressure is -----

- f) Bitot's spot is seen in-----
- g) One cause for hypopyon corneal ulcer
- h) Capsulotomy is done by -----laser
- i) One cause for congenital cataract
- j) Glaucoma seen in newborn is -----

DIPLOMA IN OPHTHALMIC ASSISTANT COURSE EXAMINATION

Time- 3 hrs
Max.marks :100

PART 2 PAPER2

OPHTHALMIC TECHNIQUES OPTICS AND REFRACTION

[Answer Section A & B separately and draw diagrams wherever necessary]

SECTION A

1. Define sterilization. Briefly discuss about the sterilization of ophthalmic instruments and theatre

[10

marks]

2. Write Short notes on

[4x5=20]

- a) Automated refraction
- b) Lens decentration
- c) Corneal preservation
- d) Chemical sterilization
- e) Transposition

3. Write very briefly on

[2x5=10]

- a) 2 Cover tests
- b) 2 Malingering tests
- c) Use of Progressive lenses
- d) 2 Uses of RAF ruler
- e) 2 complications of Pathological myopia

4. Answer to the point

[10x1=10]

- a) Rigid contact lens is made of-----
- b) Refractive error in Aphakia is-----
- c) Patching is treatment for-----
- d) In exotropia -----prism is used to measure
- e) Intraocular lens used in Phacoemulsification
- f) Name 2 oblique ocular muscles
- h) -----goggle is used in diplopia charting

- i) Actions of Atropine
- j) IPD can be measured by-----

SECTION B

1. Define the methods of retinoscopy. What are the types of retinoscopes . Mention the cycloplegics used in different age groups

[10 marks]
[4x5=20]

2. Write Short notes on

- a) Irregular astigmatism
- b) Amblyopia
- c) Applanation tonometry
- d) Multifocal glasses
- e) FRIEND test

3. Write very briefly on

[2x5=10]

- a) 2 Uses of contact lens
- b) Advantages of Automated refraction
- c) 2 complications of Lens decentration
- d) 2 methods of Corneal preservation
- e) 2 uses of Jacksons cross cylinder

4. Answer to the point

[10x1=10]

- a) In exophoria ----- lenses can be used for treatment options
- b) Angle of primary deviation is equal to angle of secondary deviation in -----
- c) Laser treatment done for correction of refractive errors is -----
- d) Accomodative esotropia is treated by -----
- e) 1 action of Atropine
- f) Magnified image is seen when seen through -----lens
- g) Vertex power of spectacle is measured by-----
- h) Power of intra ocular lens for an emmetropic person is -----
- i) Colour of pupil in Aphakia is -----
- j) The size of pinhole is -----

Syllabus of Diploma Courses

Conducted by Directorate of Medical Education,

Medical College PO, Thiruvananthapuram

Course Code
:PMD-05

DIPLOMA IN DIPLOMA IN OPERATION THEATRE AND ANAESTHESIA TECHNOLOGY (DOTAT)

1. COURSE CONTENT

1		
1.1	Title of the course	DIPLOMA IN OPERATION THEATRE AND ANAESTHESIA TECHNOLOGY (DOTAT)
1.2	Aim of the course	They should be able to assist the anaesthetist in operation theatre and critical care unit.
1.3	Objective of the Course	<ul style="list-style-type: none">• They should be able to assist the anaesthetist in all his activities like preoperative assessment, IV cannulation and establishing a secure IV line, CVP cannulation, general anaesthesia, intubation, extubation, spinal anaesthesia, regional blocks, resuscitation etc.• They should be able to check the anaesthesia machine, monitors, gas cylinders, drug trolley, and should be able to manage minor trouble shooting.• They should be able to identify critical problems and complications and report to the anaesthetist immediately.• They should be able to follow the universal precautions and safety measures while handling patients as well as equipment.• They should be able to assist during cardiopulmonary resuscitation and help during anaesthetic crisis management.• They should check and maintain the A/C of the theatre, OT tables, OT light and suction system along with the surgical equipments like laparoscopes, operating microscopes etc.• Keep the equipment maintenance register and update periodically. Maintain the Anaesthesia register and statistics
1.4	Medium of instruction	English
1.5	Duration	The duration of the course shall be 2 years. plus compulsory internship for six months. The course shall be conducted under the department of <u>Anaesthesiology</u> . There shall be theory classes along with practical training and resident duty during the course.
1.6	Academic eligibility	A pass in the Higher Secondary Examination of the Board of

		Higher Secondary Education of Kerala or equivalent examinations conducted by any board in India recognized by any of Universities in Kerala with Physics, Chemistry and Biology as optional subjects and a pass with 40% marks in Physics, Chemistry and Biology put together, are eligible. Relaxation of 5% marks will be allowed to SC/ST candidates.
		Indian citizen of Kerala origin is eligible for admission.
		The Candidate should be above the age of 17
1.7	Strength/batch	Not to exceed 15 students per batch
1.8	Reservation	As per existing Government guidelines
1.9	Admission requirement	Selection to the course shall be made by the Director of Medical Education. Selection will be made on merit basis and based on the marks obtained in the qualifying examination. Selection to the management quota in the self-financing institution where the Course is granted and approved by the Government of Kerala, shall be made by the respective management with transparency.
1.10	Subjects of study	
1.10.1	First Year	
	Paper-1	Basic Science including Pharmacology
	Paper-2	Biomedical equipments
	Paper-3	Operation theatre techniques
1.10.2	Second year (PART-II)	
	Paper-1	Basic Science including Pharmacology
	Paper-2	Biomedical equipments
	Paper-3	Operation theatre techniques

2. DISTRIBUTION OF HOURS / YEAR

	2.1 Part-1: Paper-I		2.2 Part-1: Paper-II		2.3 Part-1: Paper-III	
A	Section A	Hrs	Section A	Hrs	Section A	Hrs
1	Basic Science including Pharmacology	200	Biomedical equipments	200	Operation theatre techniques	200
B	Section B		Section B		Section B	
1	Practicals Paper I	240	Paper II	240	Paper III	240
	TOTAL					
	GRAND TOTAL	440		440		440

3. DETAILED SYLLABUS

3.1 PART I – PAPER I BASIC SCIENCE INCLUDING PHARMACOLOGY

Anatomy

Cardiovascular system (Heart, Blood vessel), Respiratory system (Tracheobronchial tree, Respiratory muscles, Lungs), Central nervous system, Autonomic nervous system, Endocrine system and Gastrointestinal system.

Physiology

Cardiovascular system (Cardiac cycle, Blood pressure, Pulse, Blood grouping, Cross matching, Blood loss estimation), Respiratory system, Central nervous system, Excretory system and Endocrine system.

Pharmacology

Introduction to Anaesthesia, Definition of anaesthesia, Classification of anaesthesia, Premedication drugs, anxiolytics, Parasympatholytics, Analgesics, Opioids, NSAIDs, Vasopressors, Vasodilators, Induction agents, Muscle relaxants, Reversal agents, Inhalational agents, Oxygen and Anaesthetic gases, Emergency life-saving drugs, Local anaesthetics, Anti-allergic drugs, Intravenous fluids, Blood and blood products.

Microbiology

Infections, Antibiotics, Sterilization and disinfection, Universal precautions, Biomedical waste management, Central sterilization and supply.

3.2 PART I-PAPER II BIOMEDICAL EQUIPMENTS

1. Anaesthesia Machine including workstation
2. Gas plant, Pipeline system, cylinders, Liquid oxygen
3. OT light
4. OT table and accessories
5. Air Conditioning system
6. Airway equipments (laryngoscopes, LMA etc)
7. Defibrillator
8. Multichannel monitors (ECG, SPO₂, NIBP, IBP, TEMPERATURE, PNS, ETCO₂, CVP, ENTROPY, CARDIAC OUTPUT)
9. Pulse oxymeter and Capnograph
10. Electro Surgical Unit (Cautery)
11. Neuro Muscular monitor
12. Cardio-pulmonary bypass
13. Ventilators

*Anaesthesia ventilator

*ICU Ventilator

14. Humidifiers and Nebulizers
15. Laparoscopic equipments
16. FOB, Video Laryngoscopes

17. Infusion pump, PCA machine, syringe pump
18. Nerve locator/stimulator
19. Fluid warmer and body warmer
20. Ultrasound machine used for nerve blocks, arterial and venous cannulation
Setting, cleaning and maintenance
21. Echo machine, including Transesophageal echo
22. Tracheostomy
23. Air compressor and suction units
24. BIS monitoring, arterial and central venous line
25. ABG and TEG machine maintenance

3.3 PAPER III OPERATION THEATRE TECHNIQUES

1. Sterilization, common methods of sterilization for individual items and aseptic techniques.
2. Daily routine preparation of anaesthesia table and machine check
3. Anaesthesia machine, design, function, physical principles, safety measures and checking workstation
4. Type of anaesthesia – GA, Regional, Peripheral blocks
5. Preparation for universal precautions
6. Intubation, laryngoscope, video laryngoscope, FOB, Endotracheal tubes, face masks, airways, bougie, stillets etc
7. Blood transfusion and component therapy
8. Day to day maintenance, sterilization and preparation of ventilators
9. Setting of monitors in OT and day to day maintenance
10. Blood gas analysis, Pulmonary function test (PFT)
11. Management of shock
12. Cardiopulmonary resuscitation
13. Epidural and spinal anaesthesia- positioning, techniques and complications
14. Paediatric anaesthesia, equipments and preparation on OT
15. Bronchoscopy and Oesophagoscopy
16. Complication of positioning techniques, complication and methods of prevention
17. Electrical and fire hazards in OT
18. Supraglottic airway device – LMA, Intubating LMAs, Proseal LMA, Ambu LMA, igel
19. Oxygen therapy methods
20. Vaporizers – filling, check for leaks and maintenance
21. Sodalime canister – filling and check daily
22. Maintenance of operation register, PAC register and stock register

3.4

4. SCHEME OF TEACHING AND CLINICAL TRAINING

First Year :

1. Biomedical Engineering : 3 months

Training in the biomedical engineering section in maintenance of the theatre equipments, hospital pipeline systems, Gas manifold, Vacuum outlets, Theatre lights, Tables and electro cautery.

2. CSSD : 3 months

Training in all aspects of modern sterilization of techniques (including surgical instruments) used in operation theatre and wards.

3. General Surgery : 3 months
4. Gynaec & Obstric Surgery : 3 months

Second Year:

1. Orthopaedic surgery : 2 months
2. Cardiac surgery : 1 months
3. Neuro surgery : 1 month
4. Gastroenterology : 1 month
5. Urology & transplant : 1 month
6. Plastic & cosmetic surgery : 1 month
7. Paediatric surgery : 1 month
8. ENT : 1 month
9. Critical Care Unit : 1 month
10. Anaesthesia assessment clinic : 1 month
11. Recovery room : 1 month

Year	Subject	No of Hrs
First Yr	Theory a. Basic Sciences b. Biomedical equipments c. Operation theatre techniques	200 200 200
	Practical & Posting Biomedical & CSSD posting (1 month) a. General Surgery b. Speciality c. Obstetrics & Gynaecology d. Critical care unit	240
	TOTAL HRS	840
Second Yr	Theory a. Basic Sciences b. Biomedical equipments c. Operation theatre techniques	200 200 200
	Practical & Posting	

	a. Paediatric Surgery b. Cardiothoracic OT/Neuro Surgery OT c. Urology & Gastro OT d. ENT & Emergency operation theatre e. Recovery room & PAC posting f. Transplant unit g. Oxygen plant	240
	TOTAL HRS	840
	GRAND TOTAL	1680

- 1.1 Records
- 1.2 Log Book
- 1.3 Seminars

5 **TEACHING /LEARNING AIDS**

5.1 Books / reference books prescribed

- Text Book of Anaesthesia for DOTAT course (P.J.Saneesh)
- Text Book for Technicians in Anaesthesia (Ajay Yadhav)
- Text Book of Anaesthesia by A.K.Paul

1.2 Models/Charts:

6 **EXAMINATION**

6.1 Scheme of internal assessment –Regular internal assessment through written & practical exam shall be conducted. Minimum of 3 internal assessment & one model exam are to be conducted & average of these marks are to be tabulated and presented to the DME before the final examination. Internal Assessment marks 50

6.2 Final examination

6.2.1 The Authority to conduct the examination:

The Director of Medical Education, Government of Kerala

6.2.2 Frequency

Regular examination shall be conducted at the end of the course

Supplementary examination shall be conducted 6 months after the regular examination.

6.2.3 Eligibility

- a. Minimum of 80% attendance in theory & practical is required to appear for the final exam.
- b. Certificate of satisfactory completion of the course by the Course Director or Head of Department/Institution.

6.2.4 Schedule of Exam

- a. Regular examination shall be conducted at the end of second year which includes theory, practical & Viva voce
- b. Total 3 Papers (3 papers in the 2nd year)
- c. Each paper shall be of duration of 3 hours with total marks of 100 each. Each paper shall have 2 sections- Section A & Section B.

6.3 Examiners

Faculty with post PG teaching experience of minimum of 3 years in the concerned course/subject is eligible to be an examiner

6.4 Pass Criteria

Minimum of 45% of marks in each theory paper with a minimum of 50% of marks

in the total theory paper and a minimum of 40% of marks in the oral/practical exam, with a minimum of 50% aggregate marks of the grand total (Total theory, practical and internal assessment) – Pass certificate will be issued only on successful completion of six months practical training.

First year examination - No examination(Only internal Examination

Second year examination ---- 300

PRACTICAL ---- 100

Spotters – 30.

Table setting & positioning 30

CPR 10

Machine operation - Mark 20

Record & log Book -Marks 10

Viva Mark 50

Internal assessment 50

- 250 out of 500

6.5 First class/Distinction/Rank

Candidates scoring not less than 65% & above shall be awarded first class. Candidates scoring 75% & above shall be awarded distinction. Candidates who scores highest mark in the grand total (Theory, practical and internal assessment) in the regular examination shall be awarded the first Rank.

Any candidate who requires revaluation shall submit the request to do so within 14 days of the official declaration of the result.

6.6 Model Mark Sheet

7 MODEL QUESTION PAPERS -



GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DOTAT COURSE REGULAR/SUPPLY EXAMINATION APRIL 2022
DOTAT-S-I-APRIL-2022

Time -3hrs. **PAPER-I** Max.marks: 100

BASIC SCIENCES INCLUDING PHARMACOLOGY
(Answer Section A & B separately, draw diagrams wherever necessary)

SECTION –A

I. Write Short notes on :

(10x5=50)

- a. Succinyl Choline
- b. Applied Anatomy of Central neuraxial blockade
- c. Venturi principle and its applications in anaesthesia
- d. ASA grading
- e. Role of anaesthesia technician in conducting brachial plexus block
- f. Compare crystalloids and colloids
- g. What is Capnogram. What is its importance.
- h. Helium
- i. Methods to measure NIBP

SECTION-B

II. Write short notes on:

(10x5=50)

- a. Heparin
 - b. Autoclaving
 - c. Adrenaline
 - d. FFP
 - e. MAC
 - f. Sugammadex
 - g. What is Cardiac arrest? Explain BLS
 - h. Anatomy of Larynx with diagram of laryngoscopic view
 - i. Pulse oximetry
 - j. Humidification equipments used in operation theatre.
-



**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DOTAT COURSE REGULAR/SUPPLY EXAMINATION-APRIL 2022**

DOTAT-S-II-APRIL 2022

Time -3hrs.

PAPER-II

Max.marks: 100

BIOMEDICAL EQUIPMENTS
(Answer section A& B separately, draw diagrams wherever necessary)
SECTION-A

I. Write short notes on :

(10x5=50)

- a. Chemical methods of sterilization.
- b. What are the sources of fires and explosion in operation theater
- c. Bourdon type pressure gauge with diagram
- d. JR circuite
- e. Magill forceps
- f. Describe DLT
- g. Electro Cautery
- h. What is pin index safety system
- i. High pressure system of Boyle's anesthesia machine
- j. Components of medical gas cylinder, Describe cylinder valve

SECTION-B

II. Write short notes on :

(10x5=50)

- a. Describe with diagram part of a typical endotracheal tube
- b. Describe oropharyngeal airway with diagram
- c. Portable suction unit / apparatus
- d. Flowmeter assembly
- e. Components of circle system Indicator used in sodalime canister
- f. AMBU bag
- g. I-Gel
- h. RAE tubes
- i. Write briefly on Propofol, Thiopentone and Ketamine
- j. Describe classic LMA



**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DOTAT COURSE REGULAR/SUPPLY EXAMINATION-APRIL 2022**

DOTAT-S-III-APRIL 2022

Time -3hrs.

PAPER-III

Max.marks: 100

**OPERATION THEATRE AND ANESTHESIA TECHNIQUES
(Answer sections A & B separately, draw diagrams wherever necessary)**

SECTION-A

I Write short notes on :

(10x5=50)

- a. Basic monitors used in anaesthesia
- b. TOF (Train of Four)
- c. Different modes of ventilation. Define PEEP
- d. Position of patient for lumbar laminectomy. What are the precautions you will take while positioning.
- e. How will you prepare OT for anaesthetizing newborn child
- f. Scavenging system in OT
- g. Sterilization of OT after Biohazard case
- h. Describe briefly the working of oxygen plant
- i. USS guided central venous catheterization
- j. Videolaryngoscope

SECTION B

II. Write short notes on:

(10x5=50)

- a. T piece
 - b. How will you set theatre for anaesthetizing four year old child for inguinal herniotomy under GA with LMA and caudal epidural block
 - c. Universal precautions in OT
 - d. Laser resistant endotracheal tubes
 - e. What is NIV? Describe the different modes
 - f. How will you sterilize FOB
 - g. Emergency intubation cart
 - h. HFNO
 - i. How will you collect blood for ABG analysis.
 - j. Filling methods of vaporizer
-

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Syllabus of Diploma Courses

Conducted by Directorate of Medical Education,

Medical College PO, Thiruvananthapuram

Course Code : 06

DIPLOMA IN CARDIOVASCULAR TECHNOLOGY(DCVT)

1. COURSE CONTENT

1		
1.1	Title of the course	DIPLOMA IN CARDIOVASCULAR TECHNOLOGY(DCVT)
1.2	Aim of the course	With the advent of newer strategies in the field of Science and Technology ,Cardiovascular medical practice is considerably shifted from clinical to Laboratory oriented Cardiology.This has resulted in newer investigatory techniques for both investigative and therapeutic purposes. Hence the need for training students to handle the newer equipments .This training programme will cater the needs of those personals who will be in increasing demands in future
1.3	Objective of the Course	1.To train the student to assist the cardiologist in invasive and non invasive procedures. 2.To assist the Cardiologist in the care of patient in ICU and Post procedure ward
1.4	Medium of instruction	English
1.5	Duration	Two Years + 6 months internship. There shall be theory classes along with practical training and resident duty during the course. Duration permitted for successful Completion of the course – 4 years
1.6	Academic eligibility	A pass in the Higher Secondary Examination of the Board of Higher Secondary Education of Kerala or equivalent examinations conducted by any board in India recognized by any of Universities in Kerala with Physics, Chemistry and Biology as optional subjects and a pass with 40% marks in Physics,Chemistry and Biology put together, are eligible. Relaxation of 5% marks will be allowed to SC/STcandidates.
		Indian citizen of Kerala origin is eligible for admission.
		The Candidate should be in the above the age of 17years
1.7	Strength/batch	Not to exceed 8 students per batch
1.8	Reservation	As per existing Government guidelines
1.9	Admission requirement	Selection to the course shall be made by the Director of Medical Education. Selection will be made on merit basis and based on the marks obtained in the qualifying examination. Selection to the management quota in the

		self-financing institution where the course is granted and approved by the Government of Kerala, shall be made by the respective management with transparency.
1.10	Subjects of study	First Year 1. Anatomy of Cardiovascular system 2. Physiology of Cardiovascular system 3. Microbiology relevant to Cardiology 4. Pharmacology relevant to Cardiology 5. Pathology relevant to Cardiology 6. ECG- Principles and Practice 7. Exercise ECG Principles and Practice 8. Holter- Principles and Practice Second Year 1. Echocardiography- Principles and Practice 2. Cardiac Catheterization- Principles and Practice
1.10.1	I Year	
	Paper-1	Basic Sciences(Anatomy, Physiology, Microbiology, Pathology and Pharmacology)
	Paper 2	ECG, Exercise ECG , Holter and Miscellaneous
1.10.2	II Year	
	Paper-1	Echocardiography
	Paper-2	Cardiac Catheterization- Principles and Practice

2. DISTRIBUTION OF HOURS - First year

240 working days minimum

Each working day atleast 7 hrs training – 2 hrs Theory and 5 hrs Practical

$240 \times 7 = 1680\text{hrs}$ (480hrs Theory +1200hrs practical)

First year - Basic Sciences (Anatomy, Physiology, Microbiology ,Pathology and Pharmacology)

ECG, Exercise ECG & Holter

Practical First Year :1200 hrs

(1) ECG recording , Analysis and Interpretation – 300hrs

(2) Posting in Exercise ECG lab – Exercise ECG recording , Analysis and Interpretation: 300 hrs

(3) Posting In Holter Lab – Holter recording ,Analysis and Interpretation – 300 hrs

(4) Posting in Echocardiography – Orientation to Echo Machine and Acquisition of basic images – 150 hr

(5) Catheterization Lab – Orientation to Cath lab Equipments – 150 hrs

First Year Theory

	Anatomy (40 hrs Theory)
1	Organs in the body
2	Heart – Surface anatomy, Gross Anatomy
3	Blood vessels , Systemic Circulation _ Arterial & Venous, Peripheral Arterial system

4	Chambers of the heart, Valves ,Septae,Pericardium and its applied Anatomy
5	Fetal circulation
6	Conduction System of Heart

	Physiology (60 hrs Theory)
1	Cardiac cycle and Action Potential
2	Cardiac Chambers – Pressures , Wave forms and Saturation
3	Cardiac Circulation &Pulmonary circulation
4	Heart sounds , Murmurs
5	Pulse,Blood Pressure, Cardiac output, Stroke volume
6	Blood Pressure – Definition, Measurement, Devices, Techniques
7	Arterial and Venous Pressure waveforms
8	Physiology of Gas exchange and Transport
9	Blood gases – Techniques and Various Parameters
10	Exercise Physiology
11	Conduction System

	Microbiology (20 hrs Theory)
1	Common Organisms
2	Sepsis and Aseptic Techniques

	Pharmacology (60 hrs Theory)
1	Modes and Routes of Drug administration
2	Antiplatelets and Anti coagulants
3	Drugs in Anaphylaxis and Cardiac emergencies
4	Anti arrhythmics
5	Heart failure Medications and Pulmonary Edema Medications
6	Intra venous fluids
7	Contrast Media
8	Thrombolytic agents
9	Anti angina Medications

	Pathology/Patho Physiology (40 hrs Theory)
1	Congenital Heart disease – Common cyanotic and Acyanotic Heart disease
2	Rheumatic Heart disease
3	Myocardial Infarction
4	Heart Failure
5	Hypertension
6	Common Myocardial and Pericardial disease
7	Pulmonary Hypertension

	Electrocardiogram(ECG) (120 hrs Theory)
1	Normal ECG – waves ,Interval, recording and artifacts
2	ECG -Standardization
3	ECG changes in Arrhythmia, ACS , Electrolyte disturbances & Metabolic disturbances

4	ECG changes in Chamber Hypertrophy and Conduction Disturbances
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	Exercise ECG (80 hrs Theory)
1	Types, Indications and Contra Indications
2	Lead Placement, Monitoring, Different Protocols
3	Monitoring and Termination Endpoints
4	Drugs in exercise ECG, Defibrillators, Infusion Pumps

	Holter (40 hrs Theory)
1	Indications
2	Utility and Monitoring
3	Holter report and Interpretation of Holter data

	Miscellaneous (20 hrs Theory)
1	Stock Maintenance and Account Keeping in ECHO lab and Cath lab
2	Registers, Indents and Archiving
3	Sterilization techniques in Cath Lab
4	Digital Archiving in cath lab

Second Year

240 working days minimum

Each working day atleast 7hrs training – 2 hrs Theory and 5hrs Practical

$240 \times 7 = 1680 \text{ hrs (480hrs Theory +1200 hrs practical)}$

Practical Second Year (1200hrs)

- (1) 400 hrs - Posting in ECHO lab with training for full ECHO interpretation of a given patient with acquaintance with TEE, contrast ECHO, Stress ECHO etc...
- (2) 800 hrs - Posting in Cath lab with Acquaintance with the hardware in cath lab and assisting the Cardiologist in cath lab procedures (Diagnostic and Therapeutic), archiving of images etc ...

Theory Second Year

	Echocardiography (180 hrs Theory)
1	Principles of Echocardiography
2	Transducers
3	Anatomical planes and 17 segment model
4	M mode
5	Doppler Echocardiography principles
6	Echo assessment in Congenital and Acquired Heart diseases
7	Systolic and diastolic function assessment
8	Trans Esophageal Echocardiography

9	Stress Echocardiography
10	Contrast Echocardiography

	Cardiac Catheterization Principles and Practice (300 hrs theory)
1	Equipments in cath lab – C arm, Monitors, Pressure Transducers, Defibrillators, Emergency drugs, Records, Pacing System Analyser, IABP etc..
2	Preparation of Patient for Catheterization Procedure
3	Different Procedures in Catheterization lab
4	Recording of Pressure wave forms – Range , gain and speed adjustments for pressure recording in various chambers of Heart
5	Radiation safety in Cath lab
6	Infection control in Cath lab
7	Hardware in cath lab – Venous and arterial check flow sheaths, 3 way stop cocks, Manifold, Puncture needles, Guide wires and Dilators, Diagnostic and Therapeutic Catheters, Coronary balloons, Coronary stents including covered stents, Atrial Septostomy equipments , Device closure Equipments, TAVI hardware, Pericardiocentesis , Electrophysiology study equipments and Vascular access closure devices
8	Coronary Catheterization Procedures – Diagnostic and Interventional Procedures
9	Acquisition of cath data – Pressure, wave forms , recording technique and analysis
10	Right catheterization
11	Special procedures- Pericardiocentesis, Peripheral Angioplasty PTMC , ASD device closure, EP study, OCT study, IVUS study, Endomyocardial Biopsy, Alcohol septal ablation and TAVI

3. DETAILED SYLLABUS

- 1.1 Records
- 1.2 Log Book should be maintained and submitted at the Final Year exam time
- 1.3 Seminars : Should attend Seminars and CMEs as a part of their training Program

Internship : The course duration will be complete only after 6 months internship with full hands on training this period.

EXAMINATION

6.1 Scheme of internal assessment

Regular internal assessment through written & practical exam shall be conducted each year. Minimum of 3 internal assessment & one model exam are to be conducted & averages of these marks are to be tabulated and presented to the DME before the final examination.

6.2 Final examination

6.2.1 The Authority to conduct the examination:

The Director of Medical Education, Government of Kerala

6.2.2 Frequency

Regular examination shall be conducted at the end of the 1st and 2nd years.

Supplementary examination shall be conducted 6 months after the regular examination.

6.2.3 Eligibility

- Minimum of 80% attendance is required to appear for the final exam.
- Internal assessment marks of minimum 50 %.
- Certificate of satisfactory completion of the course by the Course Director or Head of Department/Institution.

6.2.4 Schedule of Exam

- Regular examination shall be conducted at the end of the academic year which includes only Theory paper at the end of First Year and Theory, Practical and Viva voce at the end of Second Year.
- Second Year Practical examination will cover topic from both first and Second year.
- Total 4 Theory Papers (2 papers in the 1st year and 2 papers in the 2nd year)
- Each paper shall be of duration of 3 hours with total marks of 100 each. Each paper shall have 1 Essay (20 Marks) and 8 Short Note (10 marks each).

6.3 Examiners

Faculty with post PG teaching experience of minimum of 3 years in the Cardiology (Post DM/ DNB) is eligible to be an examiner

6.4 Pass Criteria

	Max marks	Minimum marks for pass
First Year		
Paper I	100	45
Paper II	100	45
Internal assessment (Theory)	100 50/per paper	
Total	300	150
Second Year		
Paper I	100	45
Paper II	100	45
Internal assessment (Theory)	100 50/per paper	
Internal assessment (Practical +Viva voce)	50	
Practical Examination	100	67.5
Viva voce	50	
Total	500	250

Minimum of 45 % of marks in each theory paper with a minimum of 50% of marks in the total theory paper and a minimum of 45 % of marks in the oral/practical exam with a minimum of 50% aggregate marks of the grand total (Total theory, practical and internal assessment) -

A student who fails in the first year has to reappear in the supplementary examination for the failed paper conducted 6 months later but can continue the course

A student who has passed the first year will only be eligible to appear for the Second year Examination

6.4.1 Practicals **Total -----100**

1.Case Discussion	--- 20
2. ECG procedures-----	20
3.TMT procedures -----	15
4.Echo procedures -----	15
5. Holter monitoring-----	15
6.Cath study-----	15

6.5 First class/Distinction/Rank

Candidates scoring not less than 65% & above shall be awarded first class. Candidates scoring 75% & above shall be awarded distinction. Candidates who scores highest mark in the grand total (Theory (Second year 2 Papers) & Practical)in the regular exam shall be awarded the first Rank.

Any candidate who requires revaluation shall submit the request to do so within 14 days of the official declaration of the result.

7. MODEL QUESTION PAPERS

DCVT First year Examination

Paper 1
Basic Sciences

Max Marks : 100 marks
Time : 3 hrs

Draw Diagrams wherever necessary

Essay (20 Marks)

(1) Describe the cardiac cycle with the help of diagrams

Short note (8 marks each)

- (2) Coronary Sinus
- (3) Inter atrial septum and its applied anatomy
- (4) Stroke volume
- (5) Bradycardia
- (6) Adenosine
- (7) Anaphylaxis
- (8) Types of murmurs
- (9) Mitral Stenosis
- (10) Aorta and its branches

DCVT First year Examination

Paper 2 Max Marks : 100 marks
ECG, Execise ECG& Holter

Time : 3 hrs

Draw Diagrams wherever necessary

Essay (20 Marks)

- (1) Describe the normal ECG with the help of a diagram

Short note (8 marks each)

- (2) ECG changes in Myocardial Infarction
- (3) ECG changes in Hyperkalemia
- (4) Contra Indications for TMT
- (5) Indications for Holter
- (6) Bicycle ergometry
- (7) Duke score in ECG
- (8) Types of murmurs
- (9) Ventricular Tachycardia
- (10) Lead placement for normal ECG recording

DCVT Second year Examination

Paper 1
Echocardiography

Max Marks : 100 marks
Time : 3 hrs

Draw Diagrams wherever necessary

Essay (20 Marks)

- (1) Describe on the 17 segment model for wall motion assessment in Echocardiography

Short note (8 marks each)

- (2) Echo in Mitral stenosis severity assessment
- (3) TAPSE
- (4) Stage III diastolic dysfunction in ECHO
- (5) Simpsons Method for LV function assessment
- (6) Adult Echo Transducer
- (7) Pericardial effusion in ECHO
- (8) Pulmonic stenosis in ECHO
- (9) Aortic Regurgitation – Pressure Half time by ECHO
- (10) Therapeutic procedures done under ECHO guidance

DCVT Second year Examination

Paper 2 Max Marks : 100 marks
Cardiac Catheterization – Principles and Practice Time : 3 hrs

Draw Diagrams wherever necessary

Essay (20 Marks)

(1) Describe on the hardware for Balloon mitral Valvuloplasty with suitable diagrams

Short Note (8 marks each)

(2) Diagnostic Coronary Catheters

(3) CTO wires

(4) Collimation in Cath lab

(5) Digital archiving in Cath lab

(6) Sterilization in cath lab

(7) Drugs for slow flow/No reflow in Coronary Angioplasty

(8) Myocardial bridge

(10) No Ionic contrast Media

Syllabus of Diploma Courses

Conducted by Directorate of Medical Education,

Medical College PO, Thiruvananthapuram

Course code
PMD -08

DIPLOMA IN DIPLOMA NEUROTECHNOLOGY(D.NT)

Course Code :

1. COURSE CONTENT

1		
1.1	Title of the course	DIPLOMA NEUROTECHNOLOGY(D.NT).
1.2	Aim of the course	Moulding Well Trained Technicians In Neurotechnology
1.3	Objective of the Course	To impart various skillsets, practical knowledge, and expertise to the students and to provide a fundamental understanding of Neurotechnology
1.4	Medium of instruction	English
1.5	Duration	<p>The duration of the course shall be 2 Years+ 6 months Internship. The course shall be conducted under the department of NEUROLOGY.</p> <p>There shall be theory classes along with practical training and resident duty during the course.</p>
1.6	Academic eligibility	<p>A pass in the Higher Secondary Examination of the Board of Higher Secondary Education of Kerala or equivalent examinations conducted by any board in India recognized by any of Universities in Kerala with Physics, Chemistry and Biology as optional subjects and a pass with minimum of 50% marks for these subjects put together.</p> <p>Indian citizen of Kerala origin is eligible for admission.</p> <p>The Candidate should be above the age 17 years.</p>
1.7	Strength/batch	Not to exceed 6 students per batch
1.8	Reservation	As per existing Government guidelines
1.9	Admission requirement	Selection to the course shall be made by the Director of Medical Education. Selection will be made on merit basis and based on the marks obtained in the qualifying examination. Selection to the management quota in the self-financing institution where the Course is granted and approved by the Government of Kerala, shall be made by the respective management with transparency.
1.10	Subjects of study	
1.10.1	First Year (PART-I)	
	Paper-1	BASIC SCIENCES
	Paper-2	COMMON DISEASES OF THE NERVOUS SYSTEM
1.10.2	Second year (PART-II)	

	Paper-3	NEUROTECHNOLOGY-I
	Paper-4	NEUROTECHNOLOGY-II

2. DISTRIBUTION OF HOURS

2.1 Part-I: Paper-1			2.2 Part-I: Paper-2	
	TOPIC	Hrs	TOPIC	Hrs
1	ANATOMY OF BRAIN AND SPINAL CORD	1	EPILEPSY	1
2	PERIPHERAL NERVE STRUCTURE	1	ANTERIOR HORN DISORDERS	1
3	BLOOD SUPPLY OF BRAIN, SPINAL CORD	1	MUSCLE DISEASES	1
4	NEURO TRANSMITTERS	1	NEUROMUSCULAR JUNCTION DISORDERS	1
5	NEUROMUSCULAR JUNCTION - STRUCTURE, FUNCTION	1	STROKE	1
6	MUSCLE CONTRACTION PHYSIOLOGY	1	PERIPHERAL NEUROPATHY	
7	BASIC ANATOMY OF CRANIAL NERVES	1	MULTIPLE SCLEROSIS	1
8	CSF CIRCULATION	1	SLEEP DISORDERS	1
9	VISUAL PATHWAY		NEURODEVELOPMENTAL DISEASES	1
10	AUDITORY PATHWAY	1	CNS INFECTIONS	1
11	BRACHIAL PLEXUS, LUMBOSACRAL PLEXUS ANATOMY	1	CNS TUMORS	1
12	ANATOMY OF MAJOR NERVES OF UPPER AND LOWER LIMB	1	TRAUMATIC BRAIN INJURY	1
	TOTAL	12		12
	GRAND TOTAL			

Part II

Part-II: Paper-3			Part-II: Paper-4	
	TOPIC	Hrs	TOPIC	Hrs
1	NEUROBIOLOGY OF ELECTROENCEPHALOGRAM	1	NERVE CONDUCTION STUDY BASIC NEUROPHYSIOLOGY	1
2	TECHNICAL ASPECTS OF EEG RECORDING	1	TECHNICAL ASPECTS- NERVE CONDUCTION STUDY	1
3	ELECTRODE PLACEMENT,10-20 ELECTRODE SYSTEM	1	ELECTROMYOGRAPHY- TECHNICAL ASPECTS	1
4	FILTERS IN EEG	1	REPETITIVE NERVE STIMULATION	1
5	EEG ARTEFACTS	1	ELECTROPHYSIOLOGY OF GBS	1
6	NORMAL AWAKE AND SLEEP EEG	1	ELECTROPHYSIOLOGY IN PERIPHERAL NERVE DISORDERS	2
7	NORMAL VARIANTS IN EEG	1	ELECTROPHYSIOLOGY OF ANTERIOR HORN CELL DISORDERS	1
8	EEG IN EPILEPSY	4	ELECTROPHYSIOLOGY OF MUSCLE DISEASE	1
9	EVOKED POTENTIALS	2	NEUROMUSCULAR JUNCTION DISORDERS ELECTROPHYSIOLOGY	1
10	POLYSOMNOGRAPHY	1		
11	ICU EEG MONITORING	1		
12	INTRAOPERATIVE MONITORING	1		
	TOTAL	16		10
	GRAND TOTAL			

3. DETAILED SYLLABUS

3.1 PART I –

PAPER I -BASIC SCIENCES

1. Basic knowledge about neuroanatomy including lobes of brain,thalamus,basal ganglia and basics of anatomy of brain stem and spinal cord.
2. Structural knowledge about the peripheral anatomy,myelin sheath,nodes of Ranvier
3. Anatomy of circle of Willis,Major blood vessels in the anterior and posterior circulation
4. Neurobiology of major neurotransmitters in central,peripheral nervous system.
5. Structure and function of neuromuscular junction in health and disease
6. Physiology of muscle contraction ,muscle proteins,excitation-contraction coupling.
7. Basic anatomy of major cranial nerves e.g optic ,oculomotor,facial nerves
8. CSF production,circulation,absorption,anatomy of ventricular system.
9. Anatomy of major sensory ,motor pathways
10. Anatomy,course ,nerve supply of major nerves of upper and lower limbs.

3.2 PART I-PAPER II DISEASES OF THE NERVOUS SYSTEM

1. Definition of seizure,epilepsy,common types of epilepsies seen in infancy,childhood,adults
2. Various types of upper motor and lower motor neuron type anterior horn cell disorders-presentation,evaluation ,clinical course.
3. Various types of acquired and inherited muscle diseases including muscle dystrophy,congenital myopathies.
4. Neuro muscular junction disorders including myasthenia gravis,Lambert-Eaton syndrome,botulism etc.
5. Clinical features of common cerebrovascular diseases including ischemic and haemorrhagic stroke
6. Disorders of peripheral nerve including common entrapment neuropathies,acquired and inherited peripheral nerve disorders
7. Common disorders of inflammatory CNS demyelination e.g multiple sclerosis with emphasis on presentation ,evaluation.
8. Disorders of sleep physiology including parasomnias,obstructive sleep apnea
9. Neurodevelopmental disorders including cerebral palsy
10. Common CNS infections including bacterial ,tuberculous meningitis,encephalitis syndromes.
11. Clinical presentation of CNS neoplasms
12. Traumatic brain injury clinical presentation and sequelae

3.4 PART II-

PAPER 3-NEUROTECHNOLOGY -I

- 1.Neurobiological basis of EEG waveforms in health and disease
- 2.Technique of EEG electrode placement,10-20 electrode system and quality control

3. Basic knowledge about digital EEG recording including various types of filters, EEG montages
4. Identification of common waveforms seen in normal awake and sleep EEG record
5. Commonly encountered EEG artefacts and methods to avoid for optimum EEG recording
6. Identification of benign epileptiform variants in EEG
7. EEG findings in various types of epilepsies-specific findings in focal and generalized epilepsies
8. EEG findings in encephalopathies and status epilepticus including non convulsive status
9. Evoked potentials –visual, auditory, brainstem. Technique, electrode placement, various waveforms.
10. Indications, technical aspects of polysomnography and findings in common sleep disorders.
11. Indications, technical aspects of ICU EEG monitoring, ambulatory EEG, continuous EEG monitoring
12. Basics of intraoperative monitoring.

3.5 PART II –

PAPER 4-NEUROTECHNOLOGY-II

1. Physiology of neurological impulse transmission and physiological basis of nerve conduction study
2. Basic technique of nerve conduction study, quality control, parameters evaluated
3. Technique of Electromyography-surface and needle, various types of EMG needles
4. Technique of Repetitive nerve stimulation, physiological basis, findings in health and disorders of Neuromuscular transmission
5. Electrophysiology of Guillain Barre syndrome
6. Electrophysiology evaluation of anterior horn cells disorders, various criteria for diagnosis.
7. Electrophysiological evaluation of muscle disorders.

4. SCHEME OF TEACHING AND CLINICAL TRAINING

First Year :

Second Year:

Year	Subject	No of Hrs
First Yr	PART-I	
	Theory	
	<ol style="list-style-type: none"> a. Basic sciences b. Common diseases of the nervous system 	12 12
	Practical & Posting <ol style="list-style-type: none"> a. EEG LAB 	20 hours/week

	b. EMG LAB	
	TOTAL HRS	
Second Yr	PART-II Theory a. Neurotechnology-I b. Neurotechnology-II	16 10
	Practical & Posting a. EEG LAB b. EMG LAB	20hours/week

7.1 Records

7.2 Log Book-1 log book for noting down procedures performed

7.3 Seminars-Weekly seminars covering various topics

5 **TEACHING /LEARNING AIDS**

5.1 Books / reference books prescribed

1.EEG IN CLINICAL PRACTICE

Authors-K.Radhakrishnan,J.M.K. Murthy,C.Rathore

2.Electromyography and Neuromuscular Disorders

Authors-David C.Preston,Barbara Shapiro

3.Clinical Neurophysiology

Authors-U.K.Misra,J.Kalita

6 **EXAMINATION**

6.1 Scheme of internal assessment –Regular internal assessment through written & practical exam shall be conducted. Minimum of 3 internal assessment & one model exam are to be conducted & average of these marks are to be tabulated and presented to the DME before the final examination.

6.2 Final examination

6.2.1 The Authority to conduct the examination:

The Director of Medical Education, Government of Kerala

6.2.2 Frequency

Regular Examination shall be conducted at the end of the 1st and 2nd years.

Supplementary examination shall be conducted 6 months after the regular examination.

6.2.3 Eligibility

a. Minimum of 80% attendance in theory & practical is required to appear for the final exam.

b. Certificate of satisfactory completion of the course by the Course Director or Head of Department/Institution.

c.

6.2.4 Schedule of Exam

- a. Regular examination shall be conducted at the end of the academic year which includes theory, practical & Viva voce
- b. Total 4 Papers (2 papers in the 1st year and 2 papers in the 2nd year)
- c. Each paper shall be of duration of 2 hours with total marks of 100 each. Each paper shall have 2 sections- Section A & Section B.
- d. practical and viva for 50 marks for each paper

6.3 Examiners

Faculty with post PG teaching experience of minimum of 3 years in the concerned course/subject is eligible to be an examiner

6.4 Pass Criteria

Minimum of 45% of marks in each theory paper with a minimum of 50% of marks in the total theory paper and a minimum of 40% of marks in the oral/practical exam with a minimum of 50% aggregate marks of the grand total (Total theory, practical and internal assessment) –

First year examination . -	100 out of 200.
Second year examination -	100 out of 200

As part of the practical examination-candidates will have to demonstrate their skill in performing nerve conduction studies/EMG and electroencephalography recording along with answering clinically relevant questions.

6.5 First class/Distinction/Rank

Candidates scoring not less than 65% & above shall be awarded first class. Candidates scoring 75% & above shall be awarded distinction. Candidates who scores highest mark in the grand total (Theory, practical and internal assessment) in the regular examination shall be awarded the first Rank.

Any candidate who requires revaluation shall submit the request to do so within 14 days of the official declaration of the result.

6.6 Model Mark Sheet

7 MODEL MARK LIST



**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN NEURO TECHNOLOGY COURSE REGULAR/SUPPLY EXAMINATION
APRIL 2022**

DNT-F-I-APRIL-2022

Time:3 hrs.

Max. Marks.100

PAPER -I

BASIC SCIENCES

I. Essay

Describe the origin, course and supply of the radial nerve, write in detail about electrodiagnosis of wrist drop. (10)

II. Write short notes on

(5x5=25)

- a. Corticospinal tract
- b. Trigeminal nerve
- c. Lumbosacral plexus
- d. Cerebellum
- e. Saltatory conduction

III. Write briefly on-

(3x4=12)

- a. CSF circulation
- b. Blood –brain barrier
- c. Sensory supply of the hand

IV. Fill in the blanks

(3x1=3)

- a. Constrictors of the pupil are supplied by the nerve
- b. lobe is concerned with memory
- c. Sensory supply of the cornea is by



GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN NEURO TECHNOLOGY COURSE REGULAR/SUPPLY EXAMINATION
APRIL 2022

DNT-F-II-APRIL 2022

Time: 2 hrs.

Max. Marks. 50

PAPER -II

COMMON DISEASE OF THE NERVOUS SYSTEM

I. Essay

Enumerate the various stages of sleep. Write in detail about various sleep disorders
(10)

II. Write short notes :

(5x5=25)

- a. Peripheral neuropathy
- b. Sciatica
- c. AMAN
- d. Temporal lobe epilepsy
- e. Psychogenic non epileptic seizures

III. Write briefly about

(3x4=12)

- a. Parsonage – Turner syndrome
- b. LEMS
- c. Myasthenic crisis

IV. Fill in the Blanks

(3x1= 3)

- a. Saturday night palsy is related to nerve
 - b. Expand CIDP
 - c. is the neurotransmitter at the neuromuscular junction
-



GOVERNMENT OF KERALA
DIRECTORATE MEDICAL EDUCATION
DIPLOMA IN NEURO TECHNOLOGY COURSE REGULAR/SUPPLY EXAMINATION
APRIL 2022

DNT-F-III-APRIL 2022

Time: 2 hrs.

Max. Marks. 50

PAPER –III
NEUROTECHNOLOGY – I
(Draw diagrams wherever necessary)

I. Essay

Characteristics, identification and elimination of EEG artifacts.

(10)

II. Write short notes on :

(5x5=25)

- a. Nonconvulsive status epilepticus
- b. EEG in temporal lobe epilepsy
- c. System of electrode placement
- d. Special electrodes in EEG recording
- e. Periodic complexes

III. Explain

(3x4=12)

- a. Epileptic encephalopathy
- b. Video EEG
- c. Common mode rejection

IV. Fill in the blanks

(3x1=3)

- a. EEG was invented by
- b. Mid temporal electrodes are
- c. Expand PPR



**GOVERNMENT OF KERALA
DIRECTORATE MEDICAL EDUCATION
DIPLOMA IN NEURO TECHNOLOGY COURSE REGULAR/SUPPLY EXAMINATION
APRIL 2022**

DNT-F-IV-APRIL - 2022

Time: 2hrs.

PAPER -IV

Max. Marks. 50

**NEUROTECHNOLOGY -II
(Draw diagrams wherever necessary)**

- I. Essay**
EMG wave analysis and clinical applications (10)
- II. Write short notes on:** (5x5=25)
- a. Compound Muscle action Potential
 - b. NCS of demyelinating neuropathy
 - c. Single fibre EMG
 - d. BERA
 - e. Sympathetic Skin Response
- III. Write briefly on:** (3x4=12)
- a. Recruitment
 - b. Blink reflex
 - c. Conduction Block
- IV. Fill in the blanks:** (3x1=3)
- a. Mean F wave latency in lower limb is
 - b. Generator of wave 5 in BERA
 - c. Name a disease in which myotonia is seen?
-

Syllabus of Diploma Courses

Conducted by Directorate of Medical Education.

Medical College PO, Thiruvananthapuram

Course Code:07

DIPLOMA IN DIALYSIS TECHNOLOGY (DDT)

1. COURSE CONTENT

1		
1.1	Title of the course	Diploma In Dialysis Technology (DDT)
1.2	Aim of the course	To provide training for all modalities of dialysis,
1.3	Objective of the Course	Students should be capable of performing all types of dialysis, extracorporeal treatment, identifying and managing complications of dialysis, maintenance of Reverse osmosis machines, preventing /minimizing catheter related blood stream infections and disposal of biowaste.
1.4	Medium of instruction	English
1.5	Duration	The duration of the course shall be 2 years inclusive of one year internship. The course shall be conducted under the department of Nephrology. There shall be theory classes along with practical training and resident duty during the course. Duration permitted for successful Completion of the course – 4 years
1.6	Academic eligibility	A pass in the Higher Secondary Examination of the Board of Higher Secondary Education of Kerala or equivalent examinations conducted by any board in India recognized by any of Universities in Kerala with Physics, Chemistry and Biology as optional subjects and a pass with 40% marks in Physics, Chemistry and Biology put together, are eligible. Relaxation of 5% marks will be allowed to SC/ST candidates.
		Indian citizen of Kerala origin is eligible for admission.
		The Candidate should be above the age group of 17 years
1.7	Strength/batch	Not to exceed 10 students per batch depending on infrastructure
1.8	Reservation	As per existing Government guidelines
1.9	Admission requirement	Selection to the course shall be made by the Director of Medical Education. Selection will be made on merit basis and based on the marks obtained in the qualifying examination. Selection to the management quota in the self-

		financing institution where the Course is granted and approved by the Government of Kerala, shall be made by the respective management with transparency.
1.10	Subjects of study	
1.10.1	First Year	
	Paper-1	Fundamentals of Nephrology & Dialysis Technology
	Paper-2	Recent Advances in Nephrology & Dialysis Technology
1.10.2	Second year	<input type="checkbox"/> One year Internship after passing the first year examination

2. DISTRIBUTION OF HOURS

	2.1 First year: Part-1	
A	Section A	Hrs
1	Anatomy & Physiology of Genito Urinary Tract	5
2	Physiology of Vascular system	4
3	Histories and evaluation of Dialysis	3
4	Principles of Dialysis- Diffusion, Osmosis, Ultra Filtration	2
5	Principles Of Sterilization And Sterile Precautions	4
6	Vascular access for Dialysis	3
7	Hemodialysis Procedure	3
8	Anticoagulation in Hemo dialysis	2
9	Function Of Dialysis Monitors And Principles of Its Working.	2
10	Artificial Kidneys- Evolution And Types	2
11	Dialyser Reuse, Dialyser Handling,	2

	Disinfections And Disposal	
12	Water Treatment System For Dialysis.	3
13	Acute Hemodialysis Prescription	2
14	Complications During Dialysis - Short Term And Long Term.	4
	B	
	TOTAL	41hrs

A	Section A	Hrs
1	Peritoneal Dialysis	3
2	Recent Advances in Dialysis: H-E, H-F therapies in clinical dialysis	3
3	Alternative in uremia therapy	1
4	Sorbent Dialysis	1
5	Continuous Renal Replacement Therapy	2
6	Pediatric CAVH	1
7	Hemoperfusion and Dialysis in poisoning	2
8	Plasmapheresis	1
9	Adequacy of Dialysis	2
10	Infectious Disease and Infection Control	2
11	Laboratory investigations in relation to dialysis.	1
	TOTAL	19
	GRAND TOTAL	60

3.DETAILED SYLLABUS

3.1 Part I

1.ANATOMY& PHYSIOLOGY OF GENITO URINARY TRACT

- Basic Anatomy of Kidney.
- Ureter and Bladder,
- Structure of Nephrons,
- Male and Female Genito- urinary system.
- Physiology of Kidney-
- Distribution of total body water and composition of body fluids-
- Function of the normal Kidney-
- Acute renal failure-
- Chronic Renal Failure –
- Function of the artificial Kidney –
- The technique of hemodialysis.

2.PHYSIOLOGY OF VASCULAR SYSTEM.

- Blood & Blood component,
- Blood & Blood component transfusion,
- Basics of hemostasis.

3.HISTORIES AND EVALUATION OF DIALYSIS:

- The invention of dialysis –
- the first artificial kidney-
- First Human dialysis-
- Kolff's rotating drum Dialyser
- parallel flow Dialysers- Twin Coil Dialyser –
- The scuttle Dialysis System-
- Introduction of a central Dialysate supply system-
- Home dialysis.

4.PRINCIPLES OF DIALYSIS- DIFFUSION, OSMOSIS, ULTRA FILTRATION

- Diffusion-
- Osmosis –
- Ultrafiltration-
- Convective Transport –
- Solvent Drag-
- Dialysis definition –

- Concentration gradient- direction of dialysate flow-cocurrent and countercurrent- hydrostatic pressure and Osmotic pressure resistance - pressure gradient.

5.PRINCIPLES OF STERILIZATION AND STERILE PRECAUTIONS

- Identification of common infections organisms –
- Cannula site infections –
- Virus infections-
- disinfections and Sterilization.
- Sterilisation: Steam autoclave- ethylene oxide- Gamma Ray Sterilisation – Formaldehyde sterilization – Clinitest- Schiff's reagent.
- Disinfectant: Formaldehyde – Renalin- Sepsiran Chloride- Phenolic disinfectants, Isopropyl alcohol- iodine antiseptic sampling procedure –Contamination problems- sterile Technique- isolation techniques.

6.VASCULAR ACCESS FOR DIALYSIS

- General description of the cannula system- Canula implantation cannulas- activity and immobilization of the cannulated limb- position of the cannulated limb- canula cleaning- canula complications – canula infections- canula clothing- de clotting –
- the subcutaneous arterial venous fistula- advances in the access to the circulation- subclavian, jugular, femoral access- shunt, Permcath, AV Fistula Cannulation techniques- Button Hole Techniques and Rope Ladder techniques- converted fistula- grafts- single needle dialysis.

7.HEMODIALYSIS PROCEDURE:

- Rinsing and priming
- obtaining vascular access
- initial dialysis
- alarms,
- patient monitoring and complications,
- termination of dialysis
- dialysis evaluation.

8. ANTICOAGULATION IN HEMODIALYSIS

- Anticoagulation – anticoagulant- heparin- Coumadin- Lee white clotting time- activated clotting times intermittent infusion and continuous infusion- systemic

heparinization – regional heparinization- rigid heparinization- heparin rebound-
heparin modeling- saline dialysis- low molecular weight heparin.

9.FUNCTION OF DIALYSIS MONITORS AND PRINCIPLES OF ITS WORKING.

- Dialysate composition- preparation – acetate bicarbonate –Citrate - delivery system- batch type and proportion type. Water pre-treatment – water pressure regulation- temperature control – temperature sensors- chemicals proportioning – degassing – flow and negative pressure control- Monitors conductivity cell- chemical concentration monitor- temperature compensation – temperature monitors- flow rate monitors- blood leak monitors- readout devices- alarms- volumetric ultra filtration – multipatient monitors.

10.ARTIFICIAL KIDNEYS- EVOLUTION AND TYPES

- Types of dialysis – Kiildialyser, coil dialyser- parallel plate dialyser. Hollow fibredialysers – Conventional, High Flux Dialyser, High Efficiency Dialyser, comparative study of available dialysers.

11.DIALYSER REUSE, DIALYSER HANDLING, DISINFECTIONS AND DISPOSAL

- Storage and reuse of parallel plate dialysers- reuse of hollow fibredialysers- Hydrogen peroxide method – fiber bundle volume checking –disinfections or sterilization – formaldehyde- renalin quality assurances.
- Advantages and Disadvantages of Dialyser reuse.

12.WATER TREATMENT SYSTEM FOR DIALYSIS.

- Need for water treatment – Water Contaminants and toxic effects - Water Quality Standards for Hemodialysis, temperature blending valve, Sand filter, Carbon filter- water softner, Deionizer- reverse osmosis unit- Ultraviolet irradiator – pyrogen and endotoxin filters - water sampling – Chlorination and dechlorination system, Hot Disinfection System- Ozonator- Lal- Assay test, microbiological checking.

13.ACUTE HEMODIALYSIS PRESCRIPTION.

- Acute hemodialysis prescription-
- determining dialysis session length and blood flow choosing a dialyser
- Choosing the dialysis solution
- Choosing the dialysis solution flow rate temp, and UF, Heparin Dose.
-

14.COMPLICATIONS DURING DIALYSIS – SHORT TERM AND LONG TERM.

- Blood leaks- clotting- acute bleeding- line canulaseparations- hypotension- hypertension- fever- pyrogenic vomiting- headache- cardiac arrhythmias- chest pain- reactions muscle cramps- restlessness – pruritus convulsion- congestive heart failure- secondary hyperparathyroid disease- metastatic calcification – blood requirements- peripheral neuropathy- arthritis- hepatitis- uremia pericarditis.

3.2 PART II-

1. PERITONEAL DIALYSIS

- Theory- patient criteria- indications for PD- Complications of PD- Patient management during PD - CAPD

2. RECENT ADVANCES IN DIALYSIS

- H-E, H-F therapies in clinical dialysis.
- High efficiency, high flux therapies in clinical dialysis – definition of H-E therapy- Characteristics of H-E therapy- technical consideration – Clinical application of H-E therapy- Limitations and future of rapid H-E therapy.

3. ALTERNATIVES IN UREMIA THERAPY

- Hemofiltration - difference between HF and HD - technical aspect of HF- Continuous arterio venous hemodiafiltration.

4. SORBENT DIALYSIS.

- Ready sorbent system - Dialysis machine - sorbent cartridge - Dialysis bath - acetate – bicarbonate - chloride bath - sodium balance.

5. CONTINUOUS RENAL REPLACEMENT THERAPY

- CAVH, CVVH, CAVHD, CVVHD, CAVHDF, CVVHDF, SCVF- technical and operational concerns in continuous renal replacement therapy- clotting – anticoagulation a Science of clotting- bleeding – therapeutic drug removal with CAVH. Online hemodiafiltration.

6. PEDIATRIC CAVH

- Pediatric ARF, Operational principles of CAVH - Characteristics of available hemofilters.

7. HEMOPERFUSION AND DIALYSIS IN POISONING.

- Dialysis and Hemoperfusion – a choice of therapy – priming of Hemoperfusion circuit- heparinization duration- complications – management of poisoning with selected agent.

8. PLASMAPHERESIS

- Definition indication - mechanism of action- principle of treatment – technical consideration- anticoagulation – complication- new technique(Cascade filtration, cryofiltration, thermofiltration, Specific immunoglobulins adsorption) HELP system.

9. ADEQUACY OF DIALYSIS

- Clinical well being oedema, blood pressure control, improving appetite, ability to work, rehabilitation, Kt/V, URR

10. INFECTIOUS DISEASE AND INFECTION CONTROL.

- Non- Infectious agents in hemodialysis patients: Endotoxin- A, Biological toxins, blood borne pathogenesis : hepatitis b virus, hepatitis C Virus, Human Immunodeficiency virus. Bacterial infections: vascular- Access Related infections, infections through contaminated hemodialysis equipment or dialysate, or errors in reprocessing, Vancomycin - resistant enterococci and other anti microbial resistant bacteria. Infection control measures for hemodialysis units: Dialysis unit precautions, Control measure for Hepatitis B, Drug - resistant Microorganisms, recommendations for screening for hepatitis c.

11. LABORATORY INVESTIGATIONS IN RELATION TO DIALYSIS.

- Patient - urine examination, renal function test. Investigations: PCV, Urea Creatinine, Creatinine Clearances, S. Calcium, Phosphorus, alkaline phosphates, radiology, EMG, methods of assessing dialysis adequacy, Consequences of inadequate dialysis, Pitfalls in providing adequate dialysis.
- Dialysate- Electrolyte, pH, temperature, contamination

SCHEME OF TEACHING AND CLINICAL TRAINING

Year	Subject	No of Hrs
First Yr	Theory	210
	Practical & Posting	
	a. Hemodialysis room	600
	b. Peritoneal dialysis room	300
	c. Procedure room	100
	TOTAL HRS	1000
Second Yr	Internship	
	a. Hemodialysis room	1500
	b. Peritoneal dialysis room	300
	c. Procedure room	100
		2000
	TOTAL HRS	
	GRAND TOTAL	3210

- 1.1 Records
- 1.2 Log Book-details of all procedures performed/attended will be included in the log book
- 1.3 Seminars -Atleast one seminar should be done by each student

5 **TEACHING /LEARNING AIDS**

power point presentation in Laptop & projector

Teaching using black board

5.1 Books / reference books prescribed

- 1.Hand Book of Dialysis by John.P.Daugridas
- 2.Nissensons Text book of Dialysis therapy

- 1.2 Models/Charts: Charts of dialysis prescription Diet for dialysis patients, assessment of nutrition , Dialysis adequacy.

6 **EXAMINATION**

6.1 Scheme of internal assessment -Regular internal assessment through written &practical exam shall be conducted. Minimum of 3 internal assessment & one model exam are to be conducted & average of these marks are to be tabulated and presented to the DME before the final examination.

6.2 Final examination

6.2.1 The Authority to conduct the examination:

The Director of Medical Education, Government of Kerala

6.2.2 Frequency

Regular examination shall be conducted at the end of the 1st year followed by one year internship after passing the 1st year examination

Supplementary examination shall be conducted within 6 months after the regular examination.

6.2.3 Eligibility

- a. Minimum of 80% attendance in theory & practical is required to appear for the final exam.
- b. Certificate of satisfactory completion of the course by the Course Director or Head of Department/Institution.

6.2.4 Schedule of Exam

- a. Regular examination shall be conducted at the end of the first academic year which includes theory, practical & Viva voce
- b. Total ---- Papers (Two papers in the 1st year)
- c. Each paper shall be of duration of 3 hours with total marks of 100 each. Each paper shall have 2 sections- Section A & Section B. Section A Two essay questions 15 marks each, Section B seven questions 10 marks each

6.3 Examiners

Faculty with post PG teaching experience of minimum of 3 years in the concerned course/subject is eligible to be an examiner

6.4 Pass Criteria

Minimum of 45% of marks in each theory paper with a minimum of 50% of marks in the total theory paper and a minimum of 40% of marks in the oral/practical exam with a minimum of 50% aggregate marks of the grand total (Total theory, practical and internal assessment) -

First year examination

225 out of 450.

6.5 First class/Distinction/Rank

Candidates scoring not less than 65% & above shall be awarded first class. Candidates scoring 75% & above shall be awarded distinction. Candidates who scores highest mark in the grand total of regular examination (Theory, practical and internal assessment) shall be awarded the first Rank.

Any candidate who requires revaluation shall submit the request to do so within 14 days of the official declaration of the result.

6.6 Model Mark Sheet

7 MODEL MARK LIST-

Paper I -	100
PaperII-	100
Practical	50
viva,Log book -	50
Internal assessment Theory-	100
Internal assessment practical-	50

8 MODEL QUESTION PAPERS

PAPER I

Fundamentals of Nephrology & Dialysis Technology

(Max Marks 100)

- I. Write an essay on : (2x15=30)
1. Anticoagulation during hemodialysis, its monitoring, advantages and disadvantages.
 2. Discuss various stages of Dialyser reuse, its advantages and disadvantages.
- II. Write Short notes on : (7 x 10=70)
1. Ultrafiltration during Dialysis.
 2. Dialysis Disequilibrium Syndrome.
 3. Urea Reduction Ratio
 4. Access Recirculation.
 5. Hemodialysis in a patient with HIV infection.
 6. Acetate and Bicarbonate Dialysis.
 7. Reverse Osmosis System.

PAPER II

Recent Advances in Nephrology & Dialysis Technology

(Max Marks 100)

I. Write an essay on : (2x15=30)

1. Continuous Renal Replacement Therapy.
2. Plasmapheresis.

II. Write Short notes on : (7 x 10=70)

1. Peritoneal Equilibration Test.
 2. Hemoperfusion.
 3. Sorbents in Dialysis
 4. Peritonitis
 5. A V Graft
 6. Ultrafiltration failure in Peritoneal Dialysis.
 7. Nocturnal Dialysis.
-

Syllabus of Diploma Courses Conducted

by Directorate of Medical Education,

Medical College PO, Thiruvananthapuram

Course Code : PMD-13

DIPLOMA COURSE IN DENTAL HYGIENE
(DCDH)

• **COURSE CONTENT**

I	TITLE	THE GAZETTE OF INDIA EXTRAORDINARY[PartIII- Sec 4] NOTIFICATION New Delhi, the 19th August, 2008
1.1	Title of the course	DIPLOMA COURSE IN DENTAL HYGIENE (DCDH)
1.2	Aim of the course	<p>The aim of Diploma Course in Dental Hygiene under the Directorate of Medical Education is to produce adequate number of qualified Dental Hygienists in the state of Kerala. Traditionally, a “Dental Hygienist” means a person who scales, cleans or polishes teeth, or give instructions in dental hygiene. He shall work under the supervision of a Registered Dental Surgeon.</p> <ul style="list-style-type: none">• Perform the work assigned by the Dentist with ultimate perfection, dedication and punctuality.• Must acquire the scientific knowledge and skill so as to enable him to follow the instructions of his Dentist.• Continue to evince keen interest in attending continuing education programmes in the field so as to attain proficiency in the recent advances.• Be willing to share the knowledge and skills with Dental Hygienist students and fresh diploma holders and colleagues.
1.3	Objective of the Course	<p>The objective of Diploma Course in Dental Hygiene is to train a candidate so as to ensure extreme competence in dental hygiene. The objectives may be considered under,</p> <ol style="list-style-type: none">i. Knowledge (Cognitive Domain)ii. Skills (Psychomotor Domain)iii. Human values, work ethics and communication abilities (Affective Domain)

		<p>i. Knowledge</p> <ul style="list-style-type: none"> • Understanding of basic sciences relevant to dental hygiene. • Update knowledge by self-study and by attending courses, conferences and seminars relevant to the field. <p>ii. Skills</p> <ul style="list-style-type: none"> • Acquire practical skills and competence in performing various procedures specified in the syllabus. <p>iii. Human values, ethical practice and communication abilities</p> <ul style="list-style-type: none"> • Adopt ethical Principles . • Foster professional honesty and integrity. • Develop communication skills • Provide leadership and get the best out of his team in congenial working atmosphere. • Be humble and accept the limitations in his knowledge and skill and to ask for help from colleagues when needed.
1.4	Medium of instruction	Medium of instruction and Examination will be English
1.5	Duration	Duration of course shall be 2 years. The maximum period to complete the course successfully shall not exceed 4 years (double the duration of course)
1.6	Academic eligibility	A pass in the Higher Secondary Examination of the Board of Higher Secondary Education of Kerala or equivalent examinations conducted by any board in India recognized by any of Universities in Kerala with Physics, Chemistry and Biology as optional subjects and a pass with 40% marks in Physics, Chemistry and Biology put together, are eligible. Relaxation of 5% marks will be allowed to SC/ST candidates.
		Indian citizen of Kerala origin is eligible for admission.
		The Candidate should be above the age group of 17 years
1.7	Strength/batch	As approved by the Govt. of Kerala / Dental Council of India with maximum 10 students.
1.8	Reservation	As per existing Government guidelines
1.9	Admission requirement	Selection to the course shall be made by the Director of Medical Education. Selection will be made on merit basis and based on the marks obtained in the qualifying examination. Selection to the management quota in the self-financing

		institution where the Course is granted and approved by the Government of Kerala / DCI, shall be made as per the direction of Govt. of Kerala.
1.10	Subjects of study	
1.10.1	First Year (PART-I)	
	Paper-1	Anatomy, Physiology & Histology
	Paper-2	Pharmacology, Pathology & Microbiology
	Paper-3	Food, Nutrition & Radiology
1.10.2	Second year (PART-II)	
	Paper-1	Dental Hygiene & Oral Prophylaxis
	Paper-2	Dental Health Education, Community/Public Health Dentistry, Preventive dentistry
	Paper-3	Dental Materials, Dental Ethics & Jurisprudence, Orientation in Dentistry

• **DISTRIBUTION OF HOURS**

The minimum hours devoted to the under mentioned subjects shall be as follows;-

First year

PRIMARY				
	Subject	Lectures	Practicals/ Demonstrations/ Clinical	Total
•	Anatomy – General & Dental	50	100	150
•	Physiology & Histology, General and Dental	20	40	60
•	Pharmacology : General & Dental	15	10	25
•	Pathology and Microbiology	30	70	100
•	Dental radiology	10	40	50
•	Food and Nutrition	25	30	55
•	Dental Hygiene and Oral Prophylaxis	50	280	330
•	Basic knowledge of computers	20	50	70
TOTAL				840

Second year

FINAL			
Subject	Lectures	Practicals/ Demonstrations/ Clinical	Total
Dental Hygiene and oral prophylaxis	25	350	375
• Dental Health Education	50	200	250

• Community Public Health Dentistry			
• Preventive Dentistry			
Dental Ethics and Jurisprudence; Orientation in Dentistry	15		15
Dental Materials	10	10	20
Total			660

• **DETAILED SYLLABUS**

PART I – PAPER I : Anatomy, Physiology & Histology

ANATOMY, GENERAL AND DENTAL

- General structure of mucous membrane (tongue, pharynx, lips), bones, muscles, blood vessels, lymphatics, glands and nerves. Blood and nerve supply in relation to face in general and teeth and associated structures in particular.
- Elementary knowledge of development of the jaws and teeth
- Eruption, resorption & occlusion of teeth
- Relationship of teeth with investing tissues
- Muscles of mastication and facial expression
- Temporomandibular articulation
- Course and distribution of Vth and VII th Cranial nerves
- **Practical**
- Demonstration on dissected body excluding extremities
- Osteology of head and neck in general and face, including jaws in particular
- Morphology of teeth
- Alveolar process of jaw bones
- Section of tooth in situ

PHYSIOLOGY & HISTOLOGY, GENERAL & DENTAL

- **Lectures**
- Cell structure of the human body

- Brief description of the histology and functions of various dental and oral tissues eg. Gingiva, Periodontal membrane, Alveolar process, cementum, Enamel, Dentin, Nasmyths membrane, pulp etc.
 - Salivary glands ducts and Composition and function of saliva
 - Blood : Composition & functions
 - Mastication, deglutition & Phonation.
 - General outlines of the physiological processes of the human body- particularly circulatory.
-
- **Practical**
 - Study of prepared histological slides of oral and dental tissues, sections of a tooth
 - Routine blood and urine examination

PART I-PAPER II: Pharmacology, Pathology & Microbiology

PHARMACOLOGY

- Brief description, nomenclature, derivation, dosage, pharmacological action and therapeutic uses of drugs commonly used in dentistry

- **Practical**

- Preparation of gum pains, mouth washes and dentifrices

PATHOLOGY & BACTERIOLOGY, GENERAL AND DENTAL

- General principles of pathology - Inflammation degeneration and repair
- Application of general principles of pathology to tooth and surrounding tissues
- Dental anomalies
- Attrition, abrasion and erosion
- Oral manifestation of systemic diseases like diabetes, syphilis, anaemia, vitamin deficiencies and infectious diseases
- Neoplasm with reference to oral cavity
- Pathology and Bacteriology of Dental Caries and Gingival infections
- Elementary knowledge of Bacteriology, Asepsis, Infection, Immunity

- **Practical**
- Study of prepared pathological and bacteriological slides relating to oral and dental conditions

PART I-PAPER III: Food, Nutrition & Radiology

FOOD AND NUTRITION - Lectures and Practical

- Basic food chemistry in relation to general and oral health
- Physical nature of diet in prevention of dental diseases
- Carbohydrates, fats, proteins, vitamins, minerals and water in relation to dental and oral health
- General food requirements for growth, maintenance and repair of the body
- Assessment & charting of individual diet & counseling
- Effect of malnutrition on oral health

DENTAL RADIOLOGY

- Fundamental and elementary principle of Dental Radiology
- Technical aspects of dental radiographs i.e. the taking, processing and mounting of dental radiographs

• **PART II- PAPER I :**

• **Dental Hygiene & Oral Prophylaxis**

• **Lectures**

- Definition of hygiene
- Objectives of dental hygiene
- Oral prophylaxis – various methods
- Stains on teeth – extrinsic, intrinsic and their management
- Dental plaque
- Dental calculus
- Brief description and the role of Prophylaxis in Gingivitis, Periodontitis, Periodontal and Alveolar abscess

Clinical

- Instruments, technique of Oral Prophylaxis
- Destaining and polishing of teeth

- Topical application of fluorides
- Care of oral cavity and appliances during treatment of maxillofacial cases.

PART II – PAPER II: Dental Health Education, Community/Public Health

Dentistry, Preventive Dentistry

Theory

Definitions of Health and Dental Health

- Aims and objectives of Dental Health Education
- Dental health and children
- Dental health education-parents, mothers (anti and post natal), infants pre-school
- Children and grownup handicapped children
- Periodontal diseases – Etiology and prevention
- Saliva in relation to dental health and disease
- Dietary habits and dental health
- Habits and malocclusion
- Oral cancer- Etiology and prevention

Practical

- Brief outline of historical background of public health, history of dentistry and public
- Health services, dental health team in relation to community health
- Preparation of models of jaws and teeth-normal and pathological dental conditions
- Designing, drawing and painting of posters on dental health education
- Procedure for arranging short talks, skits and features on dental and oral health
- Visual aid

OPERATION ROOM TECHNIQUE AND CHAIR SIDE

ASSISTANCE LECTURES AND PRACTICALS

- Reception of patients
- Lay out of reception room
- Conversant with layout of Dental surgery and Hygienists clinic

- Chair side assistance and technique
- Clinical/ Operating room technique
- Local anaesthetic and equipment
- Methods of sterilization and care of dental instruments
- Basic principles in surgery
- The use of instruments in dental practice
- Examination and charting of teeth, gingiva, oral cavity, instructions to patients and recalls

PART II – PAPER III : Dental materials, Dental Ethics and Jurisprudence, Orientation in Dentistry

DENTAL

MATERIALS

Theory & Practical

- General knowledge of various material used in dentistry such as impression materials.
- Gypsum products, waxes, investing materials and various filling materials - temporary and permanent

DENTAL ETHICS, JURISPRUDENCE AND ORIENTATION IN DENTISTRY

Theory & Practical

- Dentists Act 1948 as it relates to registration of Dental Hygienists and Dentists. Legal impositions in relation to dental practice, Code of Ethics.
- Place and function of dental profession in the society and discussion of economic problems involved therein
- Social factors in dental progress, income and living standard of people
- Objective and scope of dentistry
- Dental specialities

• **SCHEME OF TEACHING AND CLINICAL TRAINING**

First Year :

PRIMARY				
	Subject	Lectures	Practicals/ Demonstrations/ Clinical	Total
•	Anatomy – General & Dental	50	100	150
•	Physiology & Histology, General and Dental	20	40	60
•	Pharmacology : General & Dental	15	10	25
•	Pathology and Microbiology	30	70	100
•	Dental radiology	10	40	50
•	Food and Nutrition	25	30	55
•	Dental Hygiene and Oral Prophylaxis	50	280	330
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TOTAL				840

Second Year

FINAL			
Subject	Lectures	Practical/ Demonstrations/Clinical	Total
Dental Hygiene and oral prophylaxis	25	350	375
• Dental Health Education • Community Public Health Dentistry • Preventive Dentistry	50	200	250
Dental Ethics and Jurisprudence; Orientation in Dentistry	15		15
Dental Materials	10	10	20
Total			660

WORKING SCHEDULE

- Case record - 50
- Supragingival scaling and polishing - 100 cases
- Topical fluoride application - 10 cases
- Detection of caries and preventive method - 10 cases
- Preparation of models/charts for dental health education- 5nos

SEMINAR TOPICS

- Tissues of Periodontium (Gingiva, Periodontal ligament, cementum alveolar bone illustrate with diagram)
- Definition of Hygiene-Objectives of dental hygiene
- Classification of periodontal disease and its etiologic factors
- Dental caries and its etiologic factors
- Plaque control-manual tooth brush, powered toothbrush, dentifrices, tooth-brushing methods, interdental cleaning aids, oral irrigation devices, chemical plaque control, disclosing agents.
- Periodontal instrumentation- classification, periodontal probes, explores, scaling and curettage instruments, cleansing and polishing instruments, surgical instruments
- Instruments used in Oral Surgery, Prosthetics, Conservative, Orthodontics
- Materials and medicament used in Dentistry
- Sterilization-physical, moist heat, dry heat sterilization, boiling water, chemical disinfection, commonly used disinfectants
- Principles of periodontal instrumentation
- Instrumentation in different areas of the mouth
- Sharpening of periodontal instruments
- Step by step procedure for plaque control instruction, motivation, education
- Dental health education (individual, group, community)
- Prevention of periodontal diseases
- Prevention of oral cancer
- Child dental education
- Reception of patients and record keeping
- Chair side assistance and patient care.

TEACHING /LEARNING AIDS

Books / reference books prescribed

1. Neuman and Carranza's Clinical Periodontology
2. Dental Hygiene Theory and practice Michele Leonard Darby
3. Fundamentals of periodontal instrumentation and advanced root instrumentation Jill S Nield Gehrig
4. Dental instruments A pocket guide Linda R
5. Basic guide to infection prevention and control in dentistry Pankhurst
6. Clinical text book of dental hygiene and therapy Robert Ireland
7. Clinical cases of textbook and therapy Suzanne Noble
8. Ethics Jurisprudence and practice management in dental hygiene Vicki J Kimbrough walls

9. Periodontology for the dental hygienist Dorothy A Perry
10. Foundations of Periodontics for the dental Hygienist Jill S Nield Gehrig
11. Periimplant therapy for the dental hygienist- Clinical guide to maintenance and disease complications Wingrove
12. Active learning workbook for wilkins clinical practice of the dentalhygienist Linda D Boyd
13. Mouth hygiene A text book for dental hygienist Alfred Civilon Fones
14. Community oral health practice for the dental hygienist
15. Essentials of Public Health Dentistry Soben Peter
16. Philip's Science of Dental Materials, 12/e book by Kenneth J Anusavice

6 **EXAMINATION**

Scheme of internal assessment –Regular internal assessment through written & practical exam shall be conducted. Minimum of 3 internal assessment & one model exam are to be conducted & average of these marks are to be tabulated and presented to the DME before the final examination.

- **Final examination**

- **The Authority to conduct the examination:**

The Director of Medical Education, Government of Kerala

- The examination shall be held twice a year, on such dates as may be fixed. The examination shall consist of two parts; (1) Primary (2) Final Diploma examination

- **THE PRIMARY EXAMINATION (FIRST YEAR)**

Eligibility: The examination shall be open to any student who:

- Has been enrolled during one academic year preceding the examination in an institution approved/recognized by the Dental Council of India for this purpose.
 - The candidate must have passed 10+2 or two years intermediate or equivalent course thereof with Science subjects (i.e.) Physics, Chemistry and Biology from a recognized Indian University or Pre University/Intermediate Board.
 - Has his/her name, submitted to the Board of Examiners, by the head of the institution which he/she is enrolled:
 - Produces the following Certificates signed by the Head of the institutions:-
 - of good character
 - of having attended not less than 80% of the full course of lectures delivered and practicals/ demonstrations clinical conducted in each of the subjects of examinations.

Every candidate shall forward his/her application to the Examining Body by a date fixed by that Body, accompanied by the prescribed fee. A candidate who fails to pass or present himself/herself for examination shall not be entitled to claim a refund of the fee.

Every candidate shall be examined in the following subjects comprising of three theory papers as follows:-

Paper I : Anatomy, Physiology & Histology

Paper II : Pharmacology, Pathology &

Microbiology. Paper III : Food Nutrition &

Radiology.

Marks for each of the papers shall be as under:-

Written	75
Oral	25
Practical	100
Internal Assessment:	50
marks Total	250

Each written paper shall be of three hours.

Pass Criteria:

- Every candidate shall be required to take up all subjects of the examination. A candidate failing in any paper or papers of this examination before being permitted to reappear at the subsequent examination shall produce evidence of having pursued such a course of training as the Head of the institution may determine.
- A candidate, who passes in any one or more papers of the examination shall be exempted from appearing in which he/she has passed and shall be allowed to re-appear in the rest in which he/she has failed in any subsequent examination within a period of two years.
- After two years the candidate will have to appear in all the papers of this examination.
- The minimum marks required to pass the examination shall be fifty percent in each paper both in the (i) written with oral and (ii) practical parts of the examination.
- Candidates who obtain minimum of seventy five percent marks in any paper under examination and passes in all three subjects in first attempt shall be declared to have passed with distinction in a particular subject/s. Candidates who do not pass in all the papers in the first attempt and later passes with distinction marks, shall be declared as passed but without distinction.
- As soon as possible after the examination the Board of Examiners shall publish a list of the candidates who have passed. Each successful candidate shall be granted a PRIMARY DIPLOMA.

THE FINAL DIPLOMA EXAMINATION

Eligibility: This examination shall be open to any student who,

- has been enrolled for primary academic year preceding the examination in an institution approved by the Dental Council of India for the purpose;
- has previously passed the Primary examination for the Diploma of Dental Hygienists;
- has his/her name submitted to the Board of Examiners by Head of the institution in which he/she is enrolled;
- Produces the following certificates signed by the Head of the Institution:
 - of good character;
 - of having attended not less than Eighty percent of the full course of lectures delivered and practical/ demonstration/ clinical conducted in each of the papers of the examination;
 - of having passed the primary examination in all papers
 - there shall not be a gap of more than two academic years between Primary and Final Diploma exams.

Every candidate shall forward his /her application to the examining body by a date fixed by that body, accompanied by the prescribed fee. A candidate who fails to pass or present himself/herself for examination shall not be entitled to claim a refund of the fee.

- 6.2.2.3 Every candidate shall be examined in the following subjects comprising of three papers as follows;

Paper I : Dental Hygiene & Oral Prophylaxis

Paper II : Dental Health Education, Community/Public Health

Dentistry, Preventive Dentistry

Paper III : Dental materials, Dental Ethics and Jurisprudence, Orientation in Dentistry

Marks for each of the papers shall be as under:

Written 75

Oral 25

Practical 100

Internal assessment: 50 marks (Theory: 25, Practical: 25)

Total 250

Each written paper shall be of three hours

Practical exam pattern

Paper I: Dental Hygiene & Oral Prophylaxis

1. Supragingival scaling
2. Case taking of gingivitis and periodontitis cases
3. Spotters of periodontal instruments

Paper II: : Dental Health Education, Community/Public Health Dentistry,
Preventive Dentistry

Spotters

Paper III: Dental materials, Dental Ethics and Jurisprudence, Orientation in Dentistry

Department of Prosthodontics

1. Mixing of dental materials

1. Plaster of Paris
2. Dental Stone
3. Alginate
4. Zinc oxide eugenol

2. Spotters on materials and instruments used in

prosthodontics Department of Conservative Dentistry

Mixing of dental materials

1. Zinc oxide eugenol luting
2. Zinc phosphate luting and base
3. Polycarboxylate luting
4. GIC luting and restoration
- 5.

Amalgam

Spotters

Pass Criteria: Every candidate shall be required to take up all papers of the examination. A candidate failing in any paper or papers of this examination before being permitted to reappear at the subsequent examination shall produce evidence of having pursued such a course of training as the Head of the institution may determine.

- A candidate, who passes in any one or more papers under examination shall be exempted from appearing in which he/she has passed and shall be allowed to re-appear in the rest in which he/she has failed in any subsequent examination within a period of two years. After two years the candidate will have to appear in all the paper of this examination.
- Minimum of 45% of marks in each theory paper with a minimum of 50% of marks in the total theory paper and a minimum of 40% of marks in the oral/practical exam with a minimum of 50% aggregate marks of the grand total (Total theory, practical and internal assessment)

The college authority will apply two months in advance along with practical examination date sheet to the DCI for recognition of the Diploma course

As soon as possible after the examination, the Board of examiners shall publish a list of those candidates who have passed. Each successful candidate shall be granted a

Diploma subject to the approval by DCI.

Examiners

- An Examination for the grant of Diploma of Dental Hygienists shall be conducted by a Board of three Examiners imparting training for qualification of Dental Hygienists Course approved by the Dental Council of India. One of the Examiners must be external (from outside that institution).
- Faculty with post PG teaching experience of minimum of 3 years in the concerned course/subject is eligible to be an examiner
- That medical persons teaching medical subjects may be appointed as Examiners for medical subjects even though they are not registered under the Dentist's Act 1948.
- He should be an active teacher of the concerned course or in the concerned subject/s at a recognized dental/medical institution

Minimum marks for pass

First year examination - 375 out of 750.
Second year examination - 375 out of 750
Grant total(1st year and 2nd year) -750 out of 1500.

First class/Distinction/Rank

- Candidates scoring not less than 65% & above shall be awarded first class
- Candidates who obtain minimum of Seventy five percent marks in any paper under examination shall be declared to/have passed with distinction in a particular subject provided he/she passed all subjects of examination in first attempt.
- Candidates who do not pass in all the papers of the FINAL EXAMINATION at one and the same time shall not be declared to have passed with distinction
- Candidates who scores highest mark in the grand total (Theory, practical and internal assessment) shall be awarded the first Rank.

Revaluation: Any candidate who requires revaluation shall submit the request to do so within 14 days of the official declaration of the result with payment of fee fixed for the same.

- MODEL MARK
LIST Attached

6 MODEL QUESTION PAPERS



GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN DENTAL HYGIENIST COURSE REGULAR EXAMINATION APRIL 2022
DCDH-F-I-APRIL-2022

Time : 3 hrs.

Part I - Paper -I

Max.marks : 75

ANATOMY, PHYSIOLOGY & HISTOLOGY

(Answer all questions & Draw diagrams wherever necessary. Answer Section A & B separately)

SECTION -A

- I. Describe the epithelium under the following headings:

(10)

- a. Classification
 - b. Example of each
 - c. Write briefly on Glandular epithelium
2. Describe salivary glands
- (10)
3. Write briefly on :
(3x5 =15)
 - a. Cells of connective tissue
 - b. Muscles of mastication
 - c. Paranasal air sinuses
4. Write short notes on :
(5x3=15)
 - a. Hyaline cartilage
 - b. Facial vein
 - c. Tonsil
 - d. Maxilla
 - e. C.S of bone

SECTION – B

- I. Write short notes on:
(5x4=20)
 - a. Phases of gastric secretion
 - b. Functions of leucocytes
 - c. Processes involved in urine formation
 - d. Nervous regulation of arterial blood pressure
 - e. Glucocorticoids
- II. Answer the following:-
(5x1=5)
 - a. Normal respiratory rate
 - b. Normal Packed cell Volume
 - c. Name the male sex hormone
 - d. Name the part of the brain that is important for coordination of muscular movements.
 - e. Name the contractile proteins of skeletal muscle

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GOVERNMENT OF KERALA DIRECTORATE OF MEDICAL EDUCATION DIPLOMA IN DENTAL HYGIENIST COURSE REGULAR EXAMINATION APRIL 2022

DCDH—F-II-APRIL-2022

Time : 3 hrs.

Max.marks : 75

Part I – Paper II

PHARMACOLOGY, PATHOLOGY, MICROBIOLOGY & ORAL PATHOLOGY

(Answer all questions & Draw diagrams wherever necessary.
Answer Section A,B,C & D separately)

SECTION A

- I. Classify Antihypertensives
(6)
- II. Classify peptic ulcer drugs. Mechanism of action any one group of drugs.
(6)
- III. Write short notes
(6x2=12)
- | | |
|-----------------------------|----------------------------------|
| a. Cotrimoxazole inhibitors | d. Angiotensin converting enzyme |
| b. Dentifrices | e. Heparin |
| c. Prodrugs | f. Transdermal patch |
- IV. Name the following
(6x1=6)
- | | |
|-----------------------------|--|
| a. One antiamoebic drug | d. One Beta 2 agonist used in bronchial asthma |
| b. One macrolide | e. One antiviral drug |
| c. One inhalational steroid | f. One H ₂ blocker |
- V. Mention two important adverse effect and one use of the following
(4x 1 ½ =6)
- | | |
|-----------------|---------------|
| a. Atropine | c. Penicillin |
| b. Tetracycline | d. Aspirin |

SECTION B

- I.
- a. Define neoplasm. Mention FOUR differences between benign and malignant tumours. Name TWO chemical carcinogens
(1+2+2=5)
- II. Write short notes on :
(4x2=8)
- | |
|--|
| a. Vascular events in acute inflammation |
| b. Vitamin C Deficiency |
| c. Wound healing by primary intention |

d. Syphilis

SECTION C

I. ESSAY:-

- Define Sterilisation
 - Write the principle and functioning of an Autoclave with the help of a labeled diagram
 - Name the articles that can be sterilized using Autoclave.
- (7)

II. Write short notes on:-

(2x3=6)

- Normal flora of mouth
- Satellitism

SECTION D

I. Write in detail regarding Regressive Alterations of the Teeth.

(5)

II. Write Short notes :

(4x2=8)

- Oral Submucous Fibrosis
- ANUG
- Types of Dentin
- Cemento Enamel Junction



**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN DENTAL HYGIENIST COURSE REGULAR EXAMINATION
APRIL 2022**

DCDH-F-III-APRIL-

2022

Time : 3 hrs.

Part I - Paper -III

Max.marks : 75

FOOD AND NUTRITION & RADIOLOGY

(Answer all questions Section A & B separately and draw diagrams wherever necessary)

SECTION -A

- What is the normal fasting blood sugar level in serum? How does the body regulate its sugar levels? Add a note on the diagnose, clinical features and complications of diabetes mellitus.

(1+6+8=15)

- Write short notes on

(5x5=25)

- a. Urea Cycle
- b. Ketosis
- c. Regulation of serum calcium
- d. Plasma proteins
- e. Jaundice

2. Write briefly on
(5x2=10)

- a. Pellagra
- b. Role of water in the body
- c. Mitochondria
- d. Dietary fibre
- e. Lipid profile

SECTION B

1. Explain Dental X-ray machine with its components by a suitable diagram.

(10)

2. Short notes:

(3x5=15)

- a. Grids
- b. Film processing
- c. Radiation effects on Oral Cavity:

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GOVERNMENT OF KERALA DIRECTORATE OF MEDICAL EDUCATION DIPLOMA IN DENTAL HYGIENIST COURSE REGULAR EXAMINATION APRIL 2022

DCDH-S-I-APRIL-2022

Time : 3 hrs.

Part II - Paper -I

Max.marks: 75

DENTAL HYGIENE AND ORAL PROPHYLAXIS

(Answer Section A & B separately and draw diagrams wherever necessary)

SECTION - A

- I. Define Scaling. Enumerate the objectives of scaling. Describe the technique of supragingival scaling and write the differences between manual scaling and ultrasonic scaling
(2+4+4+10=20)
- II. Write short notes on:
(3x5=15)
 - a. Universal precautions
 - b. Theories of calculus formation

- c. Cementoenamel junction

SECTION -B

- III. Define and classify dental plaque. Describe the structure and composition of dental plaque. Write a note on the formation of dental plaque. What are the factors which favours plaque retention.

(2+5+8+5=20)

- IV. Write short notes on:

(4x5=20)

- a. Classification of periodontal diseases
 - b. Parts of gingival
 - c. Structural components of periodontal ligament
 - d. Functions of cementum.
-



**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN DENTAL HYGIENIST COURSE REGULAR EXAMINATION
APRIL 2022**

DCDH-S-II-APRIL

2022

Time : 3 hrs.

Part II - Paper -II

Max.marks: 75

DENTAL HEALTH EDUCATION, PUBLIC HEALTH & PREVENTIVE DENTISTRY
(Answer Section A & B separately and draw diagrams wherever necessary)

SECTION - A

- I. Define plaque control. Discuss different methods of plaque control. Enumerate various devices used in mechanical plaque control.

(2+6+12=20)

- II. Write short notes on :

(3x5=15)

- a. Knutson's technique
- b. Ethical principles
- c. Dental hygienist

SECTION - B

- I. Define habits. Enumerate the different types of habits. Describe in detail the clinical features and management of thumb sucking.

(10+10=20)

- II. Write short notes on:

(4x5=20)

- a. Tattle tooth programme
- b. Non-projected aids in health education

- c. WHO
 - d. Incineration
-



**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN DENTAL HYGIENIST COURSE REGULAR EXAMINATION
APRIL 2022**

DCDH-S-III-APRIL 2022

Time : 3 hrs.

Part II - Paper -III

Max.marks: 75

**DENTAL MATERIALS, DENTAL ETHICS AND JURISPRUDENCE ORIENTATION IN
DENTISTRY**

(Answer Section A & B separately and draw diagrams wherever necessary)

SECTION -A

- I. Classify Glass ionomer Cements. Discuss the composition, manipulation, setting reaction and properties of Conventional Glass ionomer Cement?

(2+2+2+2+2=10)

- II. Define Dental Amalgam. Write in detail on the types of high copper amalgam, their composition and setting reactions. Add a note on Delayed expansion of Amalgam?

(1+3+3+3=10)

- III. Write short notes on:

(3x5=15)

- a. Curing lamps used for Composite restorations
- b. Types of restorations in Operative Dentistry
- c. Instrument tray setup for root canal treatment

SECTION B

- I. Classify rigid impression material. Write in detail about composition, properties and mixing technique of zinc oxide eugenol impression paste

(3+4+4+2=13)

- II. Write in detail about composition and properties of gypsum bonded investment. Add a note on factors affecting working and setting time.

(4+4+4=12)

- III. Write short notes on

(3x5=15)

- a. Setting expansion of gypsum products and factors affecting it.
 - b. Polysulfide impression material
 - c. Syneresis and imbibition
-

Syllabus of Diploma Courses

Conducted by Directorate of Medical Education,

Medical College PO, Thiruvananthapuram

Course Code :
PMD -12

DIPLOMA IN DIPLOMA COURSE IN DENTAL MECHANIC

1. COURSE CONTENT

1		
1.1	Title of the course	DIPLOMA COURSE IN DENTAL MECHANIC
1.2	Aim of the course	<p>The aim of Diploma Course in Dental Mechanics under the Directorate of Medical Education is to produce adequate number of qualified Dental Mechanics in the state of Kerala. Traditionally, a "Dental mechanic" means a person who makes or repairs denture and dental appliances. He shall restrict his activities to purely mechanical laboratory work at the instance of the registered dental surgeon. He shall not do any chair side work on patients.</p> <p>He must</p> <ul style="list-style-type: none">• Perform the laboratory work assigned by the Dentist with ultimate perfection, dedication and punctuality.• Must acquire the scientific knowledge and skill so as to enable him to follow the instructions of his Dentist.• Should be able to fabricate dental prostheses and appliances as per the requirements of the Dentist.• Contribute to the professionalism of the Dentist by performing the assigned job in time observing maximum care throughout the laboratory procedure.• Continue to evince keen interest in attending continuing education programmes in the field so as to attain proficiency in the recent advances. <p>Be willing to share the knowledge and skills with Dental Mechanic students, fresh diploma holders and colleagues</p>
1.3	Objective of the Course	<p>The objective of Diploma Course in Dental Mechanics is to train a candidate so as to ensure extreme competence in dental laboratory procedures. The objectives may be considered under,</p> <p>i. Knowledge (Cognitive Domain) ii. Skills (Psychomotor Domain) iii. Human values, work ethics and communication abilities (Affective Domain)</p> <p>i. Knowledge</p> <ul style="list-style-type: none">• Understanding of basic sciences relevant to the laboratory procedure.

		<ul style="list-style-type: none"> Update knowledge by self-study and by attending courses, conferences and seminars relevant to the field. ii. Skills <ul style="list-style-type: none"> Acquire practical skills and competence in performing various procedures specified in the syllabus. iii. Human values, ethical practice and communication abilities <ul style="list-style-type: none"> Adopt ethical principles.. Foster professional honesty and integrity. Develop communication skills Provide leadership and get the best out of his team in congenial working atmosphere. <p>Be humble and accept the limitations in his knowledge and skill and to ask for help from colleagues when needed.</p>
1.4	Medium of instruction	English
1.5	Duration	The duration of the course shall be 2 years. The course shall be conducted under the department of Prosthodontics There shall be theory classes along with practical training and resident duty during the course.
1.6	Academic eligibility	A pass in the Higher Secondary Examination of the Board of Higher Secondary Education of Kerala or equivalent examinations conducted by any board in India recognized by any of Universities in Kerala with Physics, Chemistry and Biology as optional subjects and a pass with 40% marks in Physics, Chemistry and Biology put together, are eligible. Relaxation of 5% marks will be allowed to SC/ST candidates.
		Indian citizen of Kerala origin is eligible for admission.
		The Candidate should be above the age of 17
1.7	Strength/batch	To start with, maximum 10 students. Once the first batch passes out after completion of course satisfactorily, intake of students may be enhanced to a maximum of 20 students.
1.8	Reservation	As per existing Government guidelines
1.9	Admission requirement	Selection to the course shall be made by the Director of Medical Education. Selection will be made on merit basis and based on the marks obtained in the qualifying examination. Selection to the management quota in the self-financing institution where the Course is granted and approved by the Government of Kerala, shall be made by the respective management with transparency.
1.10	Subjects of study	
1.10.1	First Year (PART-I)	
	Paper-1	Applied Physics, Applied Chemistry and Mechanics
	Paper-2	Dental Mechanics (Complete Denture and Removable Partial Denture)
	Paper-3	Applied Oral Anatomy
1.10.2	Second year (PART-II)	
	Paper-1	Dental Mechanics (Fixed Partial Denture and Orthodontic Appliances)
	Paper-2	Dental Materials and Dental Metallurgy
	Paper-3	Basic knowledge of Computer and Medical Records Management

2. DISTRIBUTION OF HOURS

	2.1 Part-1: Paper-1		2.2 Part-1: Paper-II		2.3 Part-1: Paper-III	
A	Section A	Hrs	Section A	Hrs	Section A	Hrs
1	General properties of matter	5 Hrs	Infection control measures for impressions and models	1 Hrs	Elementary anatomy and structure of denture/bearing area.	2 Hrs
2	Thermal properties of matter	8 Hrs	Cast and Cast Duplication	1 Hrs	Human dentition and occlusion.	4 Hrs
3	Principles of electro-technology	7 Hrs	Special Trays	2 Hrs	Functions of teeth and morphology of Crowns of teeth.	4 Hrs
4	Applied mechanics	10 Hrs	Occlusion Rims and Articulation	4 Hrs	Tooth Carving in wax and plaster-Practicals	90 Hrs
5	Applied Physics – Exercises and Demonstrations	10Hrs	Principles of selection of teeth and arrangement	5 Hrs		
6	Applied Mechanics – Exercises and Demonstrations	10Hrs	Flasking, Acrylising Finishing and Polishing of dentures	5 Hrs		
7			Repair and Reline	1 Hrs		
8			Immediate dentures	1 Hrs		
9			Cast and Cast Duplication - Practicals	20 Hrs		
10			Special Trays - Practicals	20 Hrs		
11			Occlusion Rims and Articulation-Practicals	100 Hrs		
12			Principles of selection of teeth and arrangement-Practicals	100 Hrs		
			Flasking, Acrylising Finishing and Polishing of dentures-Practicals	100 Hrs		
			Repair and Reline- Practicals	10 Hrs		
	TOTAL	50 Hrs		370 Hrs		100 hrs
B	Section B		Section B		Section B	
1	Physical and chemical	2 Hrs	Cast Partial	1 Hr	Muscles of	3 Hrs

	changes		Denture-Kennedy Classification		mastication and facial expression	
2	Elements, mixtures, and compounds;	2 Hrs	Cast Partial Components	2 Hrs	Mastication deglutition and phonation.	2 Hrs
3	Oxygen oxides, burning and rusting; Hydrogen;	2 Hrs	Principles of partial denture design	5 Hrs	Movements of temporomandibular joint.	5 Hrs
4	Laws of chemical combination; Valency;	2 Hrs	Principles of wire bending, Preparation of wrought clasps,	2 Hrs		
5	Acids, bases and salts.	2 Hrs	Fabrication of Acrylic partial dentures – Class I, Class II, Class III, Class IV- Practicals	150 Hrs		
6	Electrolysis	4 Hrs	Designing and wax pattern fabrication - Practicals	100 Hrs		
7	General characteristics of the metals	8 Hrs				
8	Carbon and its compounds	8 Hrs				
9	Applied Chemistry– Exercises and Demonstrations	20 Hrs				
	TOTAL	50 Hrs		260 Hrs		10 Hrs
	GRAND TOTAL	100 Hrs		630 Hrs		110 Hrs

Part II

	2.4 Part-II: Paper-1		2.5 Part-II: Paper-II		2.6 Part-II: Paper-III	
A	Section A	Hrs	Section A	Hrs	Section A	Hrs
1	Plaster of Paris; Dental Stone, Die Stone Investment Materials,	6 Hrs	Introduction to FPD	1 Hr	General office routine economics, record-keeping services, Professional referrals and computing skill;	2 Hrs
2	Impression Materials	3 Hrs	Components of FPD	4 Hrs	Record keeping of materials intended and audit of use.	3 Hrs
3	Tray Materials	2 Hrs	Working casts	3 Hrs	Receipt and	2 Hrs

			and Dies		dispatch of work from clinicians	
4	Denture Base Materials, both for cold curing and heat curing, Tooth Materials	6 Hrs	Wax Pattern Fabrication	3 Hrs	Medical Record Management	3 hrs
5	Base Plates and Waxes	4 Hrs	Casting machines and Principles of casting	5 Hrs	Practicals	10 Hrs
6	Zinc Oxide	1 Hrs	Metal Ceramic and All Ceramic crowns	4 Hrs		
7	Dental Luting Cements	3 Hrs	Maxillofacial Prosthodontics - Practicals	150 Hrs		
8	Dental Ceramics and indirect resin restoration materials.	5 Hrs	Fabrication of single crowns	100 Hrs		
9	Manipulation of Gypsum Products	20 Hrs	Fabrication of Fixed Dental prostheses	100 Hrs		
10	Manipulation of Impression and Duplicating Materials	20 Hrs	Designing Implant supported Prosthesis	50 Hrs		
11	Manipulation of Acrylic Resins	20 Hrs	Porcelain firing techniques	50 Hrs		
	TOTAL	90 Hrs		520 Hrs		20 Hrs
B	Section B		Section B		Section B	
1	Metals used in Dentistry	3 Hrs	Mechanical principles of Orthodontic appliances	10 hrs		
2	Alloys used in Dentistry	5 Hrs	Stainless steel wire-preparation of clasps, springs and Arch wires for Orthodontic appliances.	50 Hrs		
3	Heat treatment- annealing and tempering	5 Hrs	Use of various types of expansion screws.	50 Hrs		
4	Solders, Fluxes, Anti Fluxes.	4 Hrs	Preparation of removable Orthodontic appliances,	100 Hrs		
5	Tarnish and Corrosion.	3 Hrs	Construction of fixed Orthodontic appliances, bands, tubes and arches. Soldering and spot welding-	85 hrs		
6	Electric Deposition	2 Hrs				

7	Dental Materials Implant	3 Hrs				
8	Practicals -	35 Hrs				
	TOTAL	60 Hrs		295 Hrs		
	GRAND TOTAL	150 Hrs		815 Hrs		20 Hrs

3. DETAILED SYLLABUS

3.1 PART I – PAPER I

Section A : (Applied Physics and Mechanics)

1. Specific gravity, density, properties of matter, including cohesion, capillarity, surface tension viscosity, elasticity, diffusion and osmosis
2. Heat: Temperature and its measurements, General account of expansion by heat of solids, liquids and gases,
3. Unit of heat, thermal capacity and specific Heat,
4. Methods of heat transfer- conduction, convection and radiation.
5. Change of State :Latent heat; Melting point
6. Principles of electro-technology applied to dental work room,
7. Electroplating, electro-forming, and anodizing
8. Wiring regulations relating to low voltage supplies.
9. Exercises/ Demonstrations:
 - i. Balance - weighing correct to a milligram.
 - ii. Determination of specific gravity by the principle of Archimedes (Solids and liquids).
 - iii. Determination of surface tension of a liquid by capillary rise.
 - iv. Determination of Linear expansion of solids (level method).
 - v. Determination of the specific heats of solids and liquids by the method of mixtures.
 - vi. Small motors-constructural features and characteristics (Demonstration only) - - - Determination of the electro-chemical - equivalent of copper.
10. Forces, Parallelogram and triangle of forces.
11. Moments, Couples, Centre of gravity
12. Principles of lever and cantilever
13. Work, Energy; Power, Friction
14. Mechanical properties including stress and strain
15. Exercises/Demonstrations:
 - Verification of the parallelogram and triangle laws of forces.
 - Inclined plane Determination of mechanical advantage.
 - Determination of Young's Modulus by bending of beams

Section B: (Applied Chemistry)

1. Distinction between physical and chemical change;
2. Elements, mixtures, and compounds;
3. Composition of the atmosphere;
4. Oxygen oxides, burning and rusting;
5. Water solvent properties and crystallization; action of water on metals; composition of water hydrogen;
6. Laws of chemical combination; meaning of chemical symbols valency; simple chemical equations;
7. Acids, bases and salts.
8. Electrolysis, The ionic theory of solution. The electro potential series, electroplating,

9. General characteristics of the metals with special reference to those used in the dental work room.
10. Alcohol, ethers, aldehydes and ketones, fatty acids and their more important derivatives, amines. Simple treatment of carbohydrates, fats and proteins, Benzene and its homologues. General characteristics of aromatic substances.
11. Synthetic resins and plastics used in Dentistry.
12. Exercises/Demonstrations
 - i. -Tests for Acids and alkalis radicals.
 - ii. -Acid-base Titration- Neutralisation of acids with alkalis. Titration of N/ 10 NaOH with N/10 H₂SO₄ Phenolphthalein or Methyl red as indicator 24-
 - iii. -Total Nitrogen determination in organic nitrogenous materials, digestion and distillation.
 - iv. -Total Nitrogen determination in In-organic (ammoniacal) solutions (or salts) by direct distillation with Mg.
 - v. -Determination of Phosphorus in in-organic materials by precipitation.
 - vi. -Determination of Potassium in aqueous solution by perchlorate method.
 - vii. -Electrolytic deposition (electrolysis and electroplating of metals)
 - viii. (c) deposition of copper by electrolysis of copper sulphate solution,
 - ix. (d) Calculation of E.C. E

3.2 PART I-PAPER II (Dental Mechanics - Primary)

Section : A

1. Infection control measures for impressions and models
2. Impression Preservation and Boxing-in.
3. Cast: Preparation, Trimming, including Orthodontic casts.
4. Cast duplication - various methods.
5. Construction of special trays - spacers .
6. Bite blocks- base plates and wax rims.
7. Articulators: Classification, daily uses, and care of articulators.
8. Adjustments, Mounting of casts. .
9. Articulation, Occlusal plane, protrusive balance, working bite, balancing bite, curve of space, compensating curve, lateral curve.
10. Principles of selection of teeth.
11. Setting of teeth and wax finishing.
12. Flasking, Dewaxing, Packing, curing and deflasking.
13. Finishing and polishing of dentures.
14. Additions, repairs, relining and rebasing of dentures.
15. Immediate denture construction.

Section: B

1. Making of acrylic teeth.
2. Kennedy's classification of partial dentures.
3. Principles of partial denture, design, clasp
4. Surveyor, surveying, path of insertion and removal.
5. Establishment of clasp seat. Clasp's parts, classification, function and reciprocation.
6. Occlusal rests and lingual bars.
7. Principles of wire bending, Preparation of wrought clasps,

3.3 PART I-PAPER III (Applied Oral anatomy)

Section A :

1. Elementary anatomy and structure of denture/bearing area.
2. -Human dentition and occlusion.

3. Functions of teeth
4. Morphology of Crowns of teeth
5. Exercise/Demonstrations
6. Tooth Carving in wax and plaster. (Crown and root, scale and enlarged models)

Section B :

1. Muscles of mastication and facial expression
2. -Mastication deglutition and phonation.
3. Movements of temporomandibular joint

3.4 PART II- PAPER I

(Dental Mechanics - Final)

Section A :

1. Introduction to FPD
2. Components of FPD
3. Wax Pattern Fabrication
4. Working casts and Dies
5. Casting machines and Principles of casting
6. Metal Ceramic and All Ceramic crowns
7. Maxillofacial Prosthodontics - Practicals
8. Fabrication of single crowns
9. Fabrication of Fixed Dental prostheses
10. Designing - Implant supported Prosthesis
11. Porcelain firing techniques

Section B :

1. Mechanical principles of Orthodontic appliances
2. Stainless steel wire-preparation of clasps, springs and Arch wires for Orthodontic appliances.
3. Use of various types of expansion screws.
4. Preparation of removable Orthodontic appliances Activators, Retention appliances and Oral screen.
5. Construction of fixed Orthodontic appliances, bands, tubes and arches. Soldering and spot welding
6. Casting techniques of partial denture (Skeletal) Clasps, bars, occlusion rest.- Setting of teeth and completion of dentures on metal skeletons

3.5

PART II – PAPER II (Dental Materials and Metallurgy)

Section A

1. Composition, Properties, Uses, Advantages & Disadvantages of the following materials:-
2. Plaster of Paris; Dental Stone, Die Stone
3. Investment Materials,
4. All Impression Materials,
5. Tray Materials,
6. Denture Base Materials, both for cold curing and heat curing, Tooth Materials Waxes,
7. Base Plates
8. Zinc Oxide,
9. Dental Luting Cements
10. Dental Ceramics and indirect resin restoration materials.

Section B

1. Metallurgical Terms,

2. Metals used in Dentistry particularly Gold, Silver, Copper, Zinc, Tin, Lead and Aluminium.
3. Alloys used in Dentistry particularly, Casting Gold Wrought Gold Silver Alloys, Stainless Steel, Chrome Cobalt Alloys.
4. Heat treatment-annealing and tempering.
5. Solders, Fluxes, Anti Fluxes.
6. Tarnish and Corrosion.
7. Electric Deposition. –
8. Dental implant materials

3.6 PART II – PAPER III (Basic Knowledge of Computer and Medical Records Management)

Section A:

1. Basic knowledge of computers

- General office routine economics, record-keeping services, Professional referrals and computing skill;
- Record keeping of materials intended and audit of use.
- Receipt and dispatch of work from clinicians

2. Medical record management

4. SCHEME OF TEACHING AND CLINICAL TRAINING

First Year :

Second Year:

Year	Subject	No of Hrs
First Yr	PART-I	
	Theory	
	a. Applied Physics Applied Chemistry & Mechanics	60 hrs
	b. Dental Mechanics (Primary)	30 hrs
	c. Applied Oral Anatomy	20 hrs
	Practical & Posting	
	a. Applied Physics Applied Chemistry & Mechanics	40 hrs
	b. Dental Mechanics (Primary)	600 hrs
	c. Applied Oral Anatomy	90 hrs
	TOTAL HRS	840 hrs
Second Yr	PART-II	
	Theory	
	a. Dental Materials and Metallurgy	55 hrs
	b. Dental Mechanics (Final)	30 hrs
	c. Basic knowledge of computers and medical records management	10 hrs

	Practical & Posting	
	a. Dental Materials and	95 hrs
	b. Dental Mechanics (Final)	785 hrs
	c. Basic knowledge of computers and medical records management	10 hrs
	TOTAL HRS	985 hrs
	GRAND TOTAL	1825 hrs

- 10.1 Records
- 10.2 Log Book
- 10.3 Seminars

5 TEACHING /LEARNING AIDS

5.1 Books / reference books prescribed

- Zarb, G. A., Bolender, C. L., Carlsson, G. E., & Boucher, C. O. (1997). Boucher's Prosthodontic Treatment for Edentulous Patients.
- Winkler, S. (1988). Essentials Of Complete Denture Prosthodontics.
- Rahn, A. O., Ivanhoe, J. R., Plummer, K. D., & Heartwell, C. M. (2009). Textbook Of Complete Dentures.
- Kenneth D Rudd, Robert M Morrow, John E Rhoads. Dental laboratory procedures. vol. 1, Complete Dentures
- Kenneth D Rudd, Robert M Morrow John E Rhoads. Dental laboratory procedures. vol. 2, Fixed Partial Dentures
- Kenneth D Rudd; Robert M Morrow; John E Rhoads. Dental laboratory procedures. Vol. 3, Removable partial dentures.
- Rodney D. Phoenix , David R. Cagna , Charles F. DeFreest . Stewart's Clinical Removable Partial Prosthodontics 4thedn
- Alan Carr, David Brown. McCracken's Removable Partial Prosthodontics, 13thedn
- Steward, Rudd, and Kuebker. Clinical Removable Partial Prosthodontics
- Shillingburg, Herbert T., Jr.; Sather, David A.; Wilson, Edwin L., Jr.; Cain, Joseph R.; Mitchell, Donald L.; Blanco, Luis J.; and Kessler, James C. Fundamentals of Fixed Prosthodontics, Fourth Edition
- Stephen F. Rosenstiel, Martin F. Land, Junhei Fujimoto. Contemporary Fixed Prosthodontics 4thedn
- Carl E. Misch Dental Implant Prosthetics 2ndedn
- Charles A. Babbush, Jack A. Hahn. Dental Implants: The Art and Science 2ndedn
- Carl Drago, Thomas Peterson. Implant Laboratory Procedures: A Step-by-Step Guide

- Beumer III, John / Marunick, Mark T. Esposito, Salvatore J. Maxillofacial Rehabilitation: Prosthodontic and Surgical Management of Cancer-Related, Acquired, and Congenital Defects of the Head and Neck, Third Edition
- Thomas D. Taylor. Clinical Maxillofacial Prosthetics
- Varoujan A. Chalian, Joe B. Drane, S. Miles Standish Maxillofacial Prosthetics: Multidisciplinary Practice.

1.2 Models/Charts:

6 EXAMINATION

6.1 Scheme of internal assessment –Regular internal assessment through written & practical exam shall be conducted. Minimum of 3 internal assessment & one model exam are to be conducted & average of these marks are to be tabulated and presented to the DME before the final examination.

6.2 Final examination

6.2.1 The Authority to conduct the examination:

The Director of Medical Education, Government of Kerala

6.2.2 Frequency

Regular examination shall be conducted at the end of the 1st and 2nd years.

Supplementary examination shall be conducted 6 months after the regular examination.

6.2.3 Eligibility

- Minimum of 80% attendance in theory & practical is required to appear for the final exam.
- Certificate of satisfactory completion of the course by the Course Director or Head of Department/Institution.

6.2.4 Schedule of Exam

- Regular examination shall be conducted at the end of the academic year which includes theory, practical & Viva voce
- Total --6-- Papers (--3- papers in the 1st year and ---3- papers in the 2nd year)

6.3 Each paper shall be of duration of 3 hours with total marks of 75 each. Each paper shall have 2 sections- Section A & Section B, except Part II paper III (Basic Knowledge of Computer and Medical Records Management) which consists of only one section.

6.4 Examiners

Faculty with post PG teaching experience of minimum of 3 years in the concerned course/subject is eligible to be an examiner

6.4 Pass Criteria

Minimum of 45% of marks in each theory paper with a minimum of 50% of marks in the total theory paper and a minimum of 50% of marks in the oral/practical exam with a minimum of 50% aggregate marks of the grand total (Total theory, practical and internal assessment) – Candidates who scores highest mark in the grand total (Theory, practical and internal assessment) in the regular examination shall be awarded the first Rank

First year examination - 275 out of 550.

Second year examination - 225 out of 450

6.5.1 First class/Distinction/Rank

Candidates scoring not less than 60% & above shall be awarded first class. Candidates scoring 75% & above shall be awarded distinction. Candidates who scores highest mark in the grand total (Theory, practical and internal assessment) shall be awarded the first Rank.

Any candidate who requires revaluation shall submit the request to do so within 14 days of the official declaration of the result.

7 MODEL QUESTION PAPERS

**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN DENTAL MECHANIC COURSE REGULAR EXAMINATION
APRIL 2022**

Time -3hrs.

DMC-F-I-APRIL- 2022

Max.marks: 75

**PART-I Paper-I
APPLIED PHYSICS APPLIED CHEMISTRY AND MECHANICS**

(Answer section A & B separately and draw diagrams where ever necessary)

SECTION-A

- I. Differentiate between adhesion and cohesion. Discuss in detail adhesion, wetting, factors affecting wetting and contact angle. Add a note on denture retention. (3+7+3=13)
- II. Define heat. What are the units of heat? Explain the methods of heat transfer. (3+3+7=13)
- III. Write short notes on : (3x4=12)
- a. Hooke's law
 - b. Work and energy
 - c. Centre of gravity

SECTION-B

- I. Enumerate the laws of chemical combination. Explain each with suitable examples. (5+8=13)
- II. Define polymerization. Explain the procedure for compression molding of heat cure acrylic dentures. Add a note on curing cycle. (2+10=12)
- III. Write short notes on : (3x4=12)
- a. Initiators and activators of acrylic resins used in dentistry
 - b. Electrolysis
 - c. Differentiate between elements, mixtures and compounds

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GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN DENTAL MECHANIC COURSE REGULAR EXAMINATION
APRIL 2022

DMC-F-II-APRIL 2022

Time -3hrs.

Max.marks: 75

PART-I Paper-II
DENTAL MECHANICS

(Answer Section A&B separately and Draw diagrams where ever necessary)

SECTION A

- I Discuss the different anatomical landmarks in the Maxilla & mandible (13)
- II Describe in detail the method of preparing occlusal rims. Write the measurements of upper and lower occlusal rims. (13)
- III Write short notes on : (3x4=12)
- a. Surveying tools
 - b. Anatomic teeth
 - c. Arcon articulators

SECTION-B

- I. What are the components of RPD? Discuss in detail about Direct retainers in RPD (13)
- II. Describe in detail the procedure of boxing and beading an impression (12)
- VI. Write short notes on: (3x4=12)
- a. Objectives of surveying
 - b. Primary stress bearing areas in mandible for complete denture.
 - c. RPI system.
-

GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN DENTAL MECHANIC COURSE REGULAR EXAMINATION
APRIL 2022

Time -3hrs.

DMC-F-III-APRIL-2022

Max.marks: 75

PART-I Paper-III
Applied Oral Anatomy

(Answer Section A&B separately and Draw diagrams where ever necessary)

SECTION A

- I Draw and explain all the surfaces of the crown of Permanent Mandibular Right First Molar. (12)
- II Tooth numbering systems (13)
- III Write short notes :
 - a. Differences between deciduous and permanent teeth (6)
 - b. Chronology of human dentition (7)

SECTION-B

- I Draw and explain all the surfaces of the crown of permanent Maxillary Right Canine (13)
- II Describe the basic anatomy of Oral cavity (12)
- III Write short notes : (2x6=12)
 - a. Occlusal aspect of Mandibular Second Premolar
 - b. Structure of tooth

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GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN DENTAL MECHANIC COURSE REGULAR EXAMINATION
APRIL 2022

DMC-S-I-APRIL 2022

Time -3hrs.

Max.marks: 75

PART-II Paper-I
DENTAL MECHANICS
(Answer section A & B separately and Draw diagrams wherever necessary)

SECTION A

- I. Illustrate with diagram the components of an FPD. Classify pontics and write in detail the indications, advantages and disadvantages of each type of pontic. (13)
- II. Enumerate the steps in casting. Describe in detail the steps in casting of an anterior single metal ceramic crown (13)
- III. Short Notes: (3x4=12)
- a. Cast duplication
 - b. Retainers and connectors in FPD
 - c. Gingival finish lines

SECTION-B

- I. Define and classify malocclusion (13)
- II. Define a die and a working cast. Enumerate the various working casts and dies used in dentistry and elaborate on Pindex system (12)
- III. Write Short Notes: (3x4=12)
- a. Burnout
 - b. Intra alveolar space maintainer
 - c. Baker's anchorage
-

GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN DENTAL MECHANIC COURSE REGULAR EXAMINATION
APRIL 2022

Time -3hrs.

DMC-S-II-APRIL 2022

Max.marks: 75

PART-II Paper-II
DENTAL METATERIALS AND METALLURGY
(Answer Section A&B separately and Draw diagrams where ever necessary)

SECTION A

- I Classify denture base resins. Write in detail about properties and composition of heat cure acrylic resin. Add a note on compression moulding techniques (13)
- II Classify impression materials. Write in detail about rigid impression materials (13)
- III Write short notes on : (3x4=12)
 - a. Type II gypsum product
 - b. Syneresis and imbibitions
 - c. Maxillofacial prosthetic materials

SECTION-B

- IV. Define tarnish and corrosion. Explain the different types of corrosion? (13)
 - V. Explain heat treatment of gold alloys? (12)
 - VI. Write short notes on : (3x4=12)
 - a. Passivation
 - b. Flux and antflux
 - c. Types of solders
-

GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN DENTAL MECHANIC COURSE REGULAR EXAMINATION
APRIL 2022

DMC-S-III-APRIL- 2022

Time -3hrs.

Max.marks: 75

Part II - Paper III

BASIC KNOWLEDGE OF COMPUTER & MEDICAL RECORDS MANGNAGEMENT

(Draw diagrams wherever necessary)

- I.** Fill in the blanks: (5x1 = 5)
- a. The type of volatile memory from where the stored information gets lost is known as
 - b. is the smallest unit which can represent a data item or character
 - c. A standard keyboard has number of keys
 - d. CPU stands for
 - e. Is the pointer device of the computer world
- II.** Write short notes on : (5x4 = 20)
- a. Advantages and dis advantages of a computer
 - b. Random Access Memory (RAM)
 - c. Differentiate files and folders
 - d. System software
 - e. World wide web
- III.** Write briefly on : (5x6 = 30)
- a. Classification of computers based on speed and computing power
 - b. Input devices
 - c. Word processing
 - d. Medical auditing
 - e. Differentiate between internet and intranet
- IV.** Explain in detail: (2x10 = 20)
- a. What is a software? Discuss its various categories with the help of a diagram
 - b. Explain the importance of medical record management in dentistry. Add a note on coding and imdexing system.
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Syllabus of Diploma Courses

Conducted by Directorate of Medical Education,

Medical College PO, Thiruvananthapuram

Course Code : 09

DIPLOMA IN ENDOSCOPIC TECHNOLOGY (DET)

1. COURSE CONTENT

1		
1.1	Title of the course	Diploma In Endoscopic Technology (DET)
1.2	Aim of the course	To train students to become well qualified and skilled endoscopic technicians so as to improve endoscopic standards in hospitals
1.3	Objective of the Course	At the end of the training programme the candidates should be able to perform as endoscopic technicians and assist doctors in performing various endoscopic procedures
1.4	Medium of instruction	English
1.5	Duration	The duration of the course shall be 2 years+ 6 months (Practical Training). The course shall be conducted under the department of Gastroenterology. There shall be theory classes along with practical training and resident duty during the course. Duration permitted for successful Completion of the course – 4 years
1.6	Academic eligibility	A pass in the Higher Secondary Examination of the Board of Higher Secondary Education of Kerala or equivalent examinations conducted by any board in India recognized by any of Universities in Kerala with Physics, Chemistry and Biology as optional subjects and a pass with 40% marks in Physics, Chemistry and Biology put together, are eligible. Relaxation of 5% marks will be allowed to SC/ST candidates.
		Indian citizen of Kerala origin is eligible for admission.
		The Candidate should be above the age of 17yrs
1.7	Strength/batch	4 students per year to start with Not to exceed 6 students per batch
1.8	Reservation	As per existing Government guidelines
1.9	Admission requirement	Selection will be made on merit basis and based on the marks obtained in the qualifying examination. Selection to the management quota in the self-financing institution where the Course is granted, shall be done by the agency approved by the Government of Kerala with transparency.
1.10	Subjects of study	
1.10.1	First Year (PART-1)	Topics as per the detailed Syllabus in Clause 2 & 3 (No Exams

		in first year)
1.10.2	Second year (PARTII)	Topics as per the detailed Syllabus in Clause 2 & 3 (There will be exams at the end of Second year)
	Paper-1	Basic Sciences including Principles of Endoscopy
	Paper-2	Diagnostic and Therapeutic Endoscopy
	Paper-3	Endoscopic Accessories, Reprocessing & Recent Advances
1.10.3	Internship	6 Months Internship –non stipendiary
1.10.4	Practical	
	Module I	Handling of Endoscope for Diagnostic Endoscopy
	Module II	Handling of Accessories for Therapeutic Endoscopy
	Module III	Reprocessing of Endoscope

2. **DISTRIBUTION OF HOURS** (Practical training in gastroenterology occurs in endoscopy unit and students are supposed to assist in the various diagnostic & therapeutic procedures. No separate hours of posting is required .They are supposed to be there in the endoscopy unit till procedures are completed. Practical training is exclusively limited to gastroenterology department. No practical training in other departments)

	2.1 First Year		2.2 First Year		2.3 First Year	
A	Basic Sciences	Hrs	Principles of Endoscopy	Hrs	General	Hrs
1	Anatomy	10	Rigid Endoscopy	25	Patient handling	10
					Ethics	
2	Physiology & Biochemistry	15	Flexible fibroptic Endoscopy		Etiquettes in endoscopy unit	
3	Pharmacology	05	Video Endoscopy		First Aid	
4	Physics	10	Video processors		Record Keeping	5
5	Computer Skill	10	Light Sources		Storage and Maintenance	10
	TOTAL	50		25		25

	2.4 Second year		2.5 Second Year		2.6 Second Year	
A	Principles of Endoscopy	Hrs	Use of Accessory Equipments	Hrs	Reprocessing of Endoscopes and Accessories	Hrs
1	Gastroscopy	5	Endoscopic Accessories and Consumables	10		
2	Colonoscopy	5	Biopsy Handling	5		
3	Duodenoscopy	5	Suction Apparatus	5		
4	Enteroscopy, Biliary and Pancreatic Endoscopy	5	Electrocautery device, Argon Plasma coagulator, Laser Photocoagulation	10		

5	Laparoscopy Gastrointestinal	-	5				
6	Laparoscopy Gynaecology	-	5				
7	Bronchoscopy		5				
8	Mediastinoscopy		5				
9	Cystoscopy		5				
10	Other Endoscopes		5				
11	Endosonography		3				
12	Capsule Endoscopy		2				
	GRAND TOTAL		55		30		15

3. DETAILED SYLLABUS

3.1.1 ANATOMY (Applied aspects)

1. Oropharynx & Esophagus
2. Stomach
3. Small Intestine
4. Colon & Rectum
5. Omentum & Peritoneum
6. Hepatobiliary system & Pancreas
7. Genitourinary system
8. Nasopharynx
9. Trachea, Bronchopulmonary segment
10. Reproductive Organs- Uterus, ovary

3.1.2 PHYSIOLOGY (Applied aspects)

1. Digestive system- Swallowing , digestion & absorption. Defecation .Secretory and motility function of GIT & Liver
2. Respiratory System-Upper respiratory tract and lower respiratory tract basic functions & respiratory sounds
3. Cardiovascular system- Pulse , Blood pressure ,heart sounds
 4. Blood physiology- Anemia basics and interpretation of common lab investigations
 5. Pancreas – Exocrine & Endocrine
 6. Genitourinary system
 7. Nervous system – Including levels of consciousness, cranial nerve palsies especially IX & X cranial nerve palsies. Gross assessment of muscle weakness & paralysis.

3.1.3 BIOCHEMISTRY (Applied aspects)

1. Basics of Carbohydrate, fat & protein metabolism
2. Renal function interpretation
3. Liver function test interpretation
4. Blood sugar interpretation

3.1.4 PHARMACOLOGY (Applied aspects)

1. Essential life saving drugs
2. IV Fluids
3. Sedatives & Tranquilisers
4. Analgesics
5. Adverse Reactions of common drugs used in endoscopy

3.1.5 PHYSICS

1. Basics of Radiation physics including C Arm usage
2. Optics in Endoscopy
3. Electro surgery Principles
4. Radiation protection
- 5.

3.1.6 COMPUTER SKILL

1. Data entry
2. Report generation

3.1.7 PRINCIPLES OF ENDOSCOPY

1. Proper handling of endoscope- Leak testing, water & air channel testing , tip deflection
2. Cleaning and disinfection of endoscope
3. Proper use of accessories
4. Storage of endoscopes

3.1.8 GENERAL

1. Patient consent
2. Pre-endoscopic fitness assessment
3. Procedure description
4. Evaluation of patient vitals both physically & on multi para monitor

5. Basics of cardiopulmonary resuscitation
6. Viral markers for Hepatitis B, Hepatitis C & HIV
7. Special issues related to females during pregnancy and lactation especially regarding radiation exposure (ERCP), drugs.

3.2 SECOND YEAR

3.2.1 Principles of Endoscopy

1. Gastroscopy
2. Colonoscopy
3. Duodenoscopy
4. Enteroscopy
5. Laparoscopy (Gastrointestinal/Gynecology)
6. Bronchoscopy
7. Mediastinoscopy
8. Cystoscopy
9. Other endoscopes
10. Endo sonography
11. Capsule endoscopy

3.2.2 Use of Accessory Equipments along with endoscopes

1. Endoscopic Accessories and Consumables
2. Biopsy Handling
3. Suction Apparatus
4. Electrocautery device, Argon Plasma coagulator, Laser Photocoagulation

3.2.3 Reprocessing of Endoscopes and Accessories

1. **Reprocessing of endoscope including proper cleaning , disinfection after each case and proper storage after the days work.**
2. **Reprocessing of endoscopic accessories as per the discretion of individual institutions**

3 SCHEME OF TEACHING AND CLINICAL TRAINING

4.1 First Year :

- 1) Regular theory classes from Gastroenterology department
- 2) Basics in applied sciences in the afternoon (can be common class for all paramedical courses)

3) 1 month each clinical posting in Urology, Gynaecology, Surgery and Pulmonary Medicine.

4.2 Second Year:

- 1) Regular theory classes from Gastroenterology department
- 2) Basics in applied sciences in the afternoon (can be common class for all paramedical courses
- 3) 1 month each clinical posting in Urology, Gynaecology, Surgery and Pulmonary Medicine.

4.3 No of Hours of Teaching

Year	Subject	No of Hrs
4.3.1	FIRST YEAR - THEORY CLASSES : 100 hrs	
1	Basic Sciences	50
a	Anatomy	10
b	Physiology and Biochemistry	15
c	Pharmacology	05
d	Physics	10
e	Computer skill - Basic knowledge in use of computers and printers - Data entry and use of Endoscopy Software	10
2	Principles of Endoscopy	25
	❖ Rigid endoscopy and Flexible fibroptic endoscopy ❖ Video endoscopy ❖ Video Processors and Light sources	
3	Patient handling, Ethics and Etiquettes in Endoscopy Unit and First Aid	10
4	Record keeping	5
5	Storage and Maintenance	10
4.3.2	SECOND YEAR – THEORY CLASSES : 100 hours	
1	Principles of Endoscopy	55
a	Gastrosocopy	5
b	Colonoscopy	5
c	Duodenoscopy	5
d	Enteroscopy, Biliary and Pancreatic Endoscopy	5
e	Laparoscopy - Gastrointestinal	5

f	Laparoscopy – Gynaecology	5
g	Bronchoscopy	5
h	Mediastinoscopy	5
i	Cystoscopy	5
j	Other Endoscopes	5
k	Endosonography	3
l	Capsule Endoscopy	2
2	Use of Accessory equipments along with endoscopes	30
a	Endoscopic Accessories and Consumables	10
b	Biopsy Handling	05
c	Suction Apparatus	05
d	Electro cautery device, Argon Plasma coagulator, Laser Photocoagulation	10
3	Reprocessing of Endoscopes and Accessories	15
4.3.3	PRACTICAL CLASSES	2000 hrs
1	Cleaning and Disinfection of Endoscopes (First year)	100
2	Cleaning and Disinfection of Accessories (First Year)	100
3	Use of Endoscopy Video Processors and Software(First year)	180
4	Assisting Diagnostic Endoscopy Procedures(Second year)	600
5	ERCP and use of X-ray Image Intensifiers(Second Year)	100
6	Endoscopic Biopsy and handling of biopsy specimens(First year)	100
7	Assisting Therapeutic Endoscopic Procedures(Second year)	300
8	Piles banding and injection(Second year)	100
9	Laparoscopy – GI Surgery(First & Second year)	100
10	Laparoscopy – Gynaecology(First & Second year)	100
11	Urology Endoscopy(First & second year)	100
12	Bronchoscopy, Thoracoscopy, Mediastinoscopy (First & second year)	100
13	Capsule Endoscopy(Second year)	10
14	Endosonography(Second year)	10

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The training after the study duration of 2 years and successfully passing the examination is for 6 months. In this period they independently assist the endoscopist during various diagnostic & therapeutic Endoscopy & colonoscopy. They assist in advanced procedures like ERCP & EUS too. Training is limited to Gastroenterology. The training should be done in the same institution. After the completion of 6 months training they will be issued course completion certificate . Diploma certificate can be issued only after completion of full course including practical training.

4.4 Records: Record book should be maintained as per direction of the course co ordinator.

4.5 Log Book- Shall be properly maintained and periodically assessed by the coordinator.

5. TEACHING /LEARNING AIDS

5.1 Library Books

1. Anatomy and physiology for nurses – Evelyn and Pearce
2. Practical Bio-chemistry for Students- V.K. Malhotra
3. Textbook of Medical Lab technology-Vol 2 -Minikumari and Dileep
4. Text book of Medical Microbiology- JayaramPanicker and Ananthanarayanan
5. Text book of Radiation physics
6. Practical Endoscopy-Peter Cotton
7. Therapeutic endoscopy-Colour Atlas-Soehendra
8. Laparoscopic surgery in Developing countries-Udwadia
9. Manual of Operative Laparoscopy- Paul
10. SAGES manual of fundamentals of Laparoscopy, Thoracoscopy and GI endoscopy
11. Introduction to Brochoscopy
12. Cystoscopy and urethroscopy for General practitioners-Lewis
13. Synopsis of Medical Instruments and Procedures, Yadav

6. EXAMINATION

6.1 Scheme of internal assessment –Regular internal assessment through written &practical exam shall be conducted. Minimum of 3 internal assessment & one model exam are to be conducted & average of these marks are to be tabulated and presented to the DME before the final examination.

6.2 Final examination

EXAMINATION		
THEORY		300 marks
Paper I	Basic Sciences including Basic Principles of Endoscopy	100 marks
Paper II	Diagnostic and Therapeutic Endoscopy	100 marks

Paper III	Endoscope Accessories, Reprocessing and Recent Advances	100 marks
PRACTICALS Practicals are an extension of what has been taught in theory. Practicals is mainly for assessing the candidates capability to assist an endoscopist independently and to handle and clean the endoscope in a proper manner which is being taught right from the beginning to the end of the course. A candidates knowledge is assessed in carrying out the procedures (both diagnostic & therapeutic) done in endoscopy room.		150 marks
Module I	Handling of Endoscope for Diagnostic Endoscopy	50
Module II	Handling of Accessories for Therapeutic Endoscopy	50
Module III	Reprocessing of Endoscope	50
VIVA VOCE		50 marks
Internal assessment Theory + practicals		100 marks
TOTAL		600 marks

6.2.1 The Authority to conduct the examination:

The Director of Medical Education, Government of Kerala

6.2.2 Frequency

Regular Examination shall be conducted at the end of the 2nd year.

Supplementary examination shall be conducted within 6 months after the regular examination.

6.2.3 Eligibility

- Minimum of 80% attendance in theory & practical is required to appear for the final exam.
- Certificate of satisfactory completion of the course by the Course Director or Head of Department/Institution.

6.2.4 Schedule of Exam

- Regular examination shall be conducted at the end of the second academic year which includes theory, practical & Viva voce
- Regular internal assessment through written & practical exam shall be conducted. Minimum of 3 internal assessment & one model exam are to be conducted & averages of these marks are to be tabulated and presented to the DME before the final examination.
- Total 3 Theory Papers and 3 practical at the end of second year
- Each paper shall be of duration of 3 hours with total marks of 100 each. Each paper shall have 2 sections- Section A & Section B.

6.3 Examiners

Faculty with post PG teaching experience of minimum of 3 years in the concerned course/subject is eligible to be an examiner

6.4 Promotion criteria

No university exams at the end of first year. Only internal assessment.

- 6.5 **Pass Criteria** Minimum of 45% of marks in each theory paper and a minimum of 50 % of marks in the oral/practical exam with a minimum of 50% aggregate marks of the grand total (Total theory, practical and internal assessment) – If a candidate fails in either theory or practicals he/she needs to write the exams again including both theory & practicals for that particular paper.

First year examination - No university Exams in First Year, only internal assessment.

Second year examination - 300 out of 600

Practical Training Independently assist in diagnostic endoscopy and colonoscopy. Assist in therapeutic procedures like Endoscopic variceal ligation , Glue injection, Polypectomy, stricture dilatation, Esophageal stenting, Bleeding ulcer hemostasis. Cleaning & reprocessing of endoscopes .Handling of biopsy specimens . Assist in ERCP & EUS (Optional). After completion of 2 years there will be 6 months training and it can be done only after clearing second year examinations .

6.6 First class/Distinction/Rank.

Candidates scoring not less than 65% & above shall be awarded first class. Candidates scoring 75% & above shall be awarded distinction. Candidates who scores highest mark in the grand total (Theory, practical and internal assessment) shall be awarded the first Rank.Candidates clearing the examination in supplementary exam will not be awarded rank.

- 6.7 **Revaluation:** Any candidate who requires revaluation shall submit the request to do so within 14 days of the official declaration of the result.

7. **MODEL QUESTION PAPERS**

**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN ENDOSCOPIC TECHNOLOGY COURSE REGULAR/SUPPLY
EXAMINATION APRIL 2022**

DET-I-APRIL 2022

Time -3hrs.

Max.marks: 100

**PAPER –I
BASIC SCIENCES INCLUDING BASIC PRINCIPLES OF ENDOSCOPY**

(Answer all questions)

SECTION-A

1. Describe anatomy of pancreas and draw diagram
2. Glutaraldehyde – Use in endoscopy theatre and precautions while using Glutaraldehyde
3. Hemogram and ESR interpretation
4. Mention different Blood products and precautions during blood transfusion
5. Discuss about blood pressure recording (5x10= 50)

SECTION-B

1. Mention different types of light source used in endoscopy processors
2. Draw a diagram of Genito urinary system in females
3. Cardio pulmonary resuscitation
4. Importance of informed consent in endoscopy procedures
5. Pre and post procedure monitoring during stricture dilatation

(5x10=50)

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**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN ENDOSCOPIC TECHNOLOGY COURSE REGULAR/SUPPLY
EXAMINATION APRIL 2022**

DET-II-APRIL 2022

Time -3hrs.

Max.marks: 100

**PAPER –II
DIAGNOSTIC AND THERAPEUTIC ENDOSCOPY**

(Answer All questions)

SECTION-A

1. Mention different types of biliary stents and draw diagram of double pigtail stent
2. Endoscope cleaning and disinfection
3. Use of Multipara monitor during endoscopic procedures
4. Universal precautions and Hepatitis B vaccination
5. Esophageal manometry

(5x10=50)

SECTION-B

1. Endoscopic variceal band ligation
2. Precautions during upper GI endoscopy in a patient with massive GI bleeding
3. Lignocaine
4. Rapid urease testing – basic principle and interpretation
5. Discuss briefly about accessories used for Colonoscopic polypectomy

(5x10=50)

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**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN ENDOSCOPIC TECHNOLOGY COURSE REGULAR/SUPPLY
EXAMINATION APRIL 2022**

DET-III—APRIL-2022

Time -3hrs.

Max.marks: 100

**PAPER –III
ENDOSCOPIC ACCESSORIES, REPROCESSING AND RECENT ADVANCES**

(Answer all questions)

SECTION- A

1. Precautions for upper GI endoscopy in a high risk patient
2. Endoscopic glue injection for gastric varices
3. Mention different types Enteroscopes
4. Discuss about emergency medicines used in endoscopy theatre
5. Draw a diagram of partially covered SEMS (self-expanding metal stent)

(5x10=50)

SECTION B

1. Esophageal Stricture dilatation
2. Handling of biopsy specimen
3. Liver biopsy – Equipment and patient preparation
4. Draw a diagram of sclerotherapy needle and mention its uses in endoscopy procedures
5. Preparation of patient for Colonoscopy

(5x10=50)

Syllabus of Diploma Courses

Conducted by Directorate of Medical Education,

Medical College PO, Thiruvananthapuram

Course
code:PMD14

DIPLOMA IN DENTAL OPERATING ROOM ASSISTANT COURSE (DORA)

1. COURSE CONTENT

1		
1.1	Title of the course	DENTAL OPERATING ROOM ASSISTANT COURSE (DORA)
1.2	Aim of the course	Dental Operating Room Assistant(DORA) is a person, not being a Dentist or Medical Practitioner; who assists the Dental Surgeon in sterilizing & at the chair side by supplying instruments, handling various dental materials & medicines as required by the Dental Surgeon.
1.3	Objective of the Course	<p>At the end of the course the student should be able to</p> <ol style="list-style-type: none">1) Communicate with patients .2) Retrieve patient's dental records.3) Provide assurance and support for the patients.4) Maintain and prepare treatment rooms and instruments.5) Ask about the patient's medical history and take blood pressure and pulse6) Prepare patients for treatment.7) Assists dental surgeon at chair side during patient treatment8) Prepare tray setups for dental procedures9) Prepare and deliver dental materials for making dental impressions and restorations.10) The processe and mount dental radiographs.11) Perform basic laboratory procedures (e.g., pouring impressions to create diagnostic casts)12) Clean and polish removable dental appliances13) Sterilize dental instruments and equipment14) Provide patients with instructions for oral care following surgery or other dental treatment procedures16) Provide postoperative patient instructions17) Maintain records of patient's treatments.18) Schedule and confirm patient's appointments.19) Collect and enter data on computer databases20) Create and send bills. Process payments.21) Order supplies and other materials for the dental

		office. 22) Manage all patients with equality, respect and dignity
1.4	Medium of instruction	English
1.5	Duration	The duration of the course shall be 2 years. The course shall be conducted under the department of Oral and Maxillofacial Surgery There shall be theory classes along with practical training and resident duty during the course.
1.6	Academic eligibility	A pass in the Higher Secondary Examination of the Board of Higher Secondary Education of Kerala or equivalent examinations conducted by any board in India recognized by any of Universities in Kerala with Physics, Chemistry and Biology as optional subjects and a pass with 40% marks in Physics, Chemistry and Biology put together, are eligible. Relaxation of 5% marks will be allowed to SC/ST candidates.
		Indian citizen of Kerala origin is eligible for admission.
		The Candidate should be above the age of 17 years.
1.7	Strength/batch	Not to exceed 10 students per batch
1.8	Reservation	As per existing Government guidelines
1.9	Admission requirement	Selection to the course shall be made by the Director of Medical Education. Selection will be made on merit basis and based on the marks obtained in the qualifying examination. Selection to the management quota in the self-financing institution where the Course is granted and approved by the Government of Kerala, shall be made by the respective management with transparency.
1.10	Subjects of study	
1.10.1	First Year (PART-I)	
	Paper-1	Anatomy, Physiology, Histology, Pathology and Bacteriology
	Paper-2	Basic nursing
	Paper-3	Computer, Office Management, Biomedical waste disposal and sterilization
1.10.2	Second year (PART-II)	
	Paper-1	Oral Anatomy & Physiology, Diseases of the teeth and gums and Dental materials
	Paper-2	Operating room technique, Chair side assistants, Dental lab routine
	Paper-3	Minor and major surgical assistance with concept of BTLS (Basic trauma life support), Dental radiographic imaging, Dental ethics and jurisprudence, orientation in dentistry

2. DISTRIBUTION OF HOURS

2.1 Primary

No	Subject	L	LD	PD	P	TOTAL
1	Anatomy (General)	50	100			150
2	Physiology & Histology (General)	20	40			60
3	Pathology & Bacteriology	30	70			100
4	Basic Nursing Training	50	50	70	100	270
5	Basic life support, CPR	02	02	02	06	12
6	Asphyxia	02	02		02	06
7	Shock	02	02	02	02	08
8	Sterilisation, disinfection and method for control of spread of diseases	16	16	16	32	80
9	Bio medical waste management	03	03	04	12	22
10	Basic computer training, including patient records & OPD management system	36	12	06	20	66
11	Food and Nutrition	10		06	10	26
12	Office assistance, Practice	20	20	10	30	80
	TOTAL					880

2.2 Final

No	Subject	L	LD	PD	P	TOTAL
1	Oral Anatomy & physiology	14	04	-	03	21
2	Diseases of teeth and gums	04	02	-	-	06
3	Materia Medica	05	-	09	20	34
4	Dental Surgery Routine	26	26	12	301	365
5	Dental laboratory routine	03	09	04	40	56
6	Surgical assistance in minor and major OT, BTLS and equipment with maintenance	05	11	21	148	185
7	Dental equipment and stores	06	01	-	24	31
8	Dental documentation and office procedures	10	06	-	105	121
9	Dental Radiography	05	02	04	20	31
10	Dental jurisprudence and Ethics	03	-	-	-	03
11	Miscellaneous				103	103
12						
						956
	L=Lecture, LD=Lecture Demonstration, PD=Practical Demonstration, P=Practical					

- The classes in different subjects of the curriculum should be taught exclusively for this course.
- For the teaching of dental subjects, no persons except those holding recognized dental qualifications shall be employed as Instructors.
- For Clinical and Practical demonstrations persons holding recognized 'Dental operating room Assistant' diploma shall be eligible.

3. DETAILED SYLLABUS

3.1 FIRST YEAR:SYLLABUS BASIC COURSE FOR DENTAL OPERATING ROOM ASSISTANT COURSE

Following subjects will be taught:

1. Florence Nightingale's basis of nursing care.
2. Tour and upkeep of the dental centre, operatory and various
3. departments.
4. Operatory discipline and discipline of the patients
5. Admission procedure to MI Room and wards
6. Manipulation of stretcher cases.
7. Basic Trauma Life Support.
8. Anatomy
 - Tissues of the body
 - Musculoskeletal system of the head and neck
 - Circulatory, Respiratory and Nervous System.
 - Skin and organs of special senses (eye, ears, nose and tongue)
9. Physiology
 - Circulatory System
 - Digestive System
 - Respiratory System
 - Endocrine System
 - Renal Function
10. Elementary Microbiology
11. First Aid and Bandaging
12. Basic life support, CPR
13. Asphyxia
14. Shock
15. Sterilization, disinfections and methods for control of spread of Diseases
16. Basic Computer trg of 2 weeks:
17. Introduction to computers, Computer Hardware (CPU), Input Devices, Storage Media, Output Devices, Printers & Other Peripherals
18. Computer software-Windows (Introduction)
19. Application Packages: MS DOS & Windows 2000, MS Word, Power point, Excel & Access.
 - Introductory class on other packages
 - Security
20. Introductory class on use of computers in hospitals.

3.2.1 Oral Anatomy & Physiology (Elementary)

1. Bones of the Skull, Maxilla and Mandible.
2. Oral cavity-Lips, tongue, pharynx & teeth.
3. Structure of teeth & surrounding tissues.
4. Dentition : temporary and permanent.
5. Nerve and blood supply of teeth & other soft tissues of the oral cavity.
6. Muscles of mastication & facial expression.
7. Saliva & control of excessive secretion in Dental Surgery.
8. Blood : RBC, WBC, Plasma.
9. Blood coagulation, Bleeding & clotting time and blood groups.

3.2.2 Diseases of Teeth & Gums (Elementary)

1. Dental caries.
2. Pulp diseases, Alveolar abscess and cellulites.
3. Periodontal diseases, Gingivitis/Periodontitis.
4. Attrition, Abrasion, Erosion and Fluorosis of teeth.

3.2.3 Diseases of concern in dental practice (Communicable)

1. Aids
2. Hepatitis

3.2.4 Materia Medica

1. Materials/Drugs and their uses in dental surgeries—abundants and astringents.
2. Preparation of solution in different percentages used in dental surgery.
3. Antiseptics & mouth washes

3.2.5 Dental Surgery routine

1. Duties of DORA
2. Personal Hygiene & Reception of patients.
3. Surgery upkeep & maintenance.
4. Infection control in dental practice.
5. Sterilisation of instruments, trays, dressings and various other items used in dental surgery. Asepsis & antiseptic methods used.
6. Care of patients in Shock & Syncope in dental chair.
7. Operation theatre technique & present concept in assistance.
8. Preparation of patients for general and local anaesthesia.
(Premedication and after care).
9. Preparation of Pathological specimen from the mouth for dental museum/lab investigation.
10. Dental emergencies & their management.
11. Home care after extraction, filling & denture insertion.
12. Oral hygiene & brushing technique.
13. First aid management & transportation of maxillofacial injury cases.
14. Layout of instrument trolleys for
 - Surgical ext of teeth.
 - Alveolectomies & Apicoectomies
 - Fracture jaws.

- Endodontics.
- Gingivectomies, Mucoperiosteal flaps.
- Denture work.

3.2.6 Radiography

1. X-Ray machine, its components and maintenance.
2. X-Ray films, methods of exposure, developing and fixing.
3. Hazards of X-Ray radiation & methods of prevention.
4. Dental radiography – Dental films, their mounting and records keeping.

3.2.7 Dental lab procedures

1. Dental materials & their manipulation : Restorative materials, Impression materials and Acrylic resins.
2. Various types of fixed & removable or the appliances used.
3. Materials used in Maxillofacial and Surgical prostheses.

3.2.8 Maxillofacial Surgery

1. Fracture Mandible & Maxilla – Main characteristics.
2. Maintenance of oral hygiene in fracture jaw cases and periodical attendance of maxillofacial injury cases during post op. period in ward.
3. Nutrition, feeding & transportation of fracture jaw cases.

3.2.9 Dental equipment and stores

1. Recognition and knowledge of various Dental equipment and stores used in Dental establishments.
2. Organisation of Dental stores. Storage, accounting and issue of Dental stores.
3. Handling and Maintenance of dental items.
4. Assembly and minor repair to dental equipment.
5. Poisonous drugs–storage & labeling; Short life items & their care, turnover.

3.2.10 Dental Documentation & office procedures

1. Knowledge about layout & upkeep of waiting rooms.
2. Registration of cases & Scheduling of appointments.
3. Dental treatment record maintenance & abbreviations for recording treatment.
4. Dental statistics including collection of Dental health information and its communication Mandatory Course Requirement of Practical / Clinical training

4. **Dental Operating Room Assistant Mandatory Course Requirement of Practical / Clinical training**

- a) BTLS practice on mannequin
- b) Pouring of models and base preparation
- c) Use of Models for
 - i) Splint fabrication
 - ii) Arch bar fixation
- d) Suturing techniques on mackintosh pillow
- e) Periodontal splints
- f) Bite block preparation
- g) Preparation of blocks for squash bite
- h) Surgery fumigation & equipment sterilization & maintenance

- i) Emergency equipment & drugs know-how
- j) Trolley layout for minor / major surgery
- k) Trolley layout for various procedures in dentistry
- l) Various X-ray techniques
- m) Assistance in various specialties:
 - i) Prosthetic dentistry
 - ii) Restorative dentistry
 - iii) Oral Surgery
 - iv) Periodontics
 - v) Endodontic
 - vi) Orthodontics
 - vii) Pediatric Dentistry

4.1 Records

4.2 Log Book

4.3 Seminars

5 **TEACHING /LEARNING AIDS**

5.1 Books / reference books prescribed

5.2 Models/Charts:

6 **EXAMINATION**

6.1 Scheme of internal assessment –Regular internal assessment through written & practical exam shall be conducted. Minimum of 3 internal assessment & one model exam are to be conducted & average of these marks are to be tabulated and presented to the DME before the final examination.

6.2 Final examination

6.2.1 The Authority to conduct the examination:

The Director of Medical Education, Government of Kerala

6.2.2 Frequency

Regular examination shall be conducted at the end of the 1st and 2nd years.

Supplementary examination shall be conducted 6 months after the regular examination.

6.2.3 Eligibility

- a. Minimum of 80% attendance in theory & practical is required to appear for the final exam.
- b. Certificate of satisfactory completion of the course by the Course Director or Head of Department/Institution.

6.2.4 Schedule of Exam

- a. Regular examination shall be conducted at the end of the academic year which includes theory, practical & Viva voce
- b. Total 6 Papers (3 papers in the 1st year and 3 papers in the 2nd year)
- c. Each paper shall be of duration of 3 hours with total marks of 100 each. Each paper shall have 2 sections- Section A & Section B.

d. MARK DISTRIBUTION FOR EACH PAPER

PRIMARY EXAMINATION First year

SUBJECT	THEORY	INTERNAL	ORAL	TOTAL	PRACTICAL	INTERNAL	TOTAL	GRAND TOTAL
PAPER I	75	25 ORAL PATHOLOGY- 25	50	150	40	10 ORAL PATHOLOGY- 10	50	200
PAPER II	75	25 BASIC NURSING -25	50	150	40	10 BASIC NURSING -10	50	200
PAPER III	75 PERIO-40 COMPUTER-35	25 PERIO-15 COMPUTER-10	50 PERIO-25 COMPUTER- 25	150	40 PERIO-20- COMPUTER -20	10 PERIO-05 COMPUTER-05	50	200

FINAL CERTIFICATE EXAMINATION

SUBJECT	THEORY	INTERNAL	ORAL	TOTAL	PRACTICAL	INTERNAL	TOTAL	GRAND TOTAL
PAPER I	75	25 ORAL PATH	50	150	40	10 ORAL PATH	50	200
PAPER II	75 SECTION A CD- 25 SECTION B PROSTHO-25 SECTION C OMFS 25	25 PROSTHO-15 CD-10	50 PROSTHO- 25 CD-25	150	40 PROSTHO-20 CD - 20	10 PROSTHO-05 CD-05	50	200
PAPER III	75 SECTION A OMFS-50 SECTION B RADIO-15 PERIO-10	25 OMFS-10 RADIO-10 PERIO-05	50 OMFS-30 RADIO-10 PERIO-10	150	40 OMFS	10 OMFS	50	200

6.3 Examiners

Faculty with post PG teaching experience of minimum of 3 years in the concerned course/subject is eligible to be an examiner

6.4 Pass Criteria

Minimum of 45% of marks in each theory paper with a minimum of 50% of marks in the total theory paper and a minimum of 40% of marks in the oral/practical exam with a minimum of 50% aggregate marks of the grand total (Total theory, practical and internal assessment) –

First year examination - 300 out of 600,

Second year examination - 300 out of 600

6.5 First class/Distinction/Rank

Candidates scoring not less than 65% & above shall be awarded first class. Candidates scoring 75% & above shall be awarded distinction. Candidates who scores highest mark in the grand total (Theory, practical and internal assessment) shall be awarded the first Rank.

Any candidate who requires revaluation shall submit the request to do so within 14 days of the official declaration of the result.

6.6 Model Mark Sheet

7 MODEL QUESTION PAPERS



GOVERNMENT OF KERALA

DIRECTORATE OF MEDICAL EDUCATION

**DIPLOMA IN DENTAL OPERATING ROOM ASSISTANCE COURSE REGULAR
EXAMINATION APRIL 2022**

DORA- F-I-APRIL- 2022

Time: 3hrs.

Max.Marks: 75.

PART-I PAPER-I

ANATOMY, PHYSIOLOGY, HISTOLOGY, PATHOLOGY & BACTERIOLOGY

(Answer all questions, Draw diagrams wherever necessary)

.....

ESSAYS

1. Describe the Temporo Mandibular Joint – Bones involved in the joint, Ligaments, Relations, Movements and Muscles involved and add a note on its applied anatomy. (15)
2. Describe in detail about Facial nerve, Orgin, Course and its relations (15)

- a. Histology of bone
 - b. Facial artery
 - c. Composition and functions of saliva
 - d. Muscles of facial expression
 - e. Shock
 - f. Submandibular gland
 - g. Mediators of inflammation
 - h. Development of tongue
 - i. Clotting mechanism
-



**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN DENTAL OPERATING ROOM ASSISTANCE COURSE REGULAR
EXAMINATION APRIL 2022**

DORA- F-II-APRIL-2022

Time: 3 hrs.

PART-I PAPER-II

Max.Marks:75

BASIC NURSING, FOOD AND NUTRITION

(Answer all questions, Draw diagrams wherever necessary)

ESSAYS

- I. Define Temperature. What are the factors affecting Temperature. Describe the management of a patient with fever.. (2+6+7=15)
- II. Define Sterilization. Explain the physical methods of sterilization. Describe autoclave in detail

(15)

III. SHORT NOTES

(9X5=45)

- a. Hot and cold application
- b. First aid kit
- c. Body Mechanics
- d. Fat soluble vitamins

- e. Oxygen administration
- f. Wound healing
- g. Hospital functions and types
- h. Diet charting
- i. Health team



**GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN DENTAL OPERATING ROOM ASSISTANCE COURSE REGULAR
EXAMINATION APRIL 2022**

DORA- F-III-APRIL 2022

Time: 3 hrs.

PART-I PAPER-III

Max.Marks : 75

**COMPUTER, OFFICE MANAGEMENT, BIOMEDICAL WASTE DISPOSAL &
STERILIZATION**

(Answer all questions Section A & B Separately and draw diagrams wherever necessary)

SECTION – A

I. ESSAY

Describe in detail about universal precautions. Steps to be followed for treating a Hepatitis B positive patient from receiving the patient to recycling of instruments and cleaning of premises. (3+7+5=15)

II. Write short notes on :

(5x5=25)

- a. Colour coding in waste management
- b. Composting
- c. Autoclave
- d. Hand washing technique
- e. Antiseptics & Disinfectants

SECTION B

III. ESSAY

Explain the block diagram of a computer and explain the function of each block

(5+10=15)

IV. SHORT NOTES

(4X5=20)

- a. Explain the Characteristics of Computers
- b. Briefly explain the functions of Operating System
- c. What is an Output Device?
- d. Briefly explain the different types of computer memory.



GOVERNMENT OF KERALA

DIRECTORATE OF MEDICAL EDUCATION

DIPLOMA IN DENTAL OPERATING ROOM ASSISTANCE COURSE REGULAR
EXAMINATION APRIL 2022

DORA-S-I-APRIL 2022

Time : 3hrs.

Max..Marks : 75

PART II -PAPER-I

ORAL ANATOMY AND PHYSIOLOGY, DISEASES OF TEETH AND GUMS AND
DENTAL MATERIALS

(Answer all questions, Draw diagrams wherever necessary)

Essays

- I Describe the macroscopic anatomy of Permanent Maxillary canine in detail. Add a note on its chronology. (13+2=15)
- II Nerve supply and blood supply of teeth (15)
- III Write Short notes on: (9x5=45)
 1. Occlusal aspect of Permanent Mandibular First Molar
 2. Temporomandibular Joint
 3. Occlusal aspect of Permanent Mandibular First Molar
 4. Difference between deciduous and permanent teeth
 5. Pulpitis
 6. Occlusal aspect of Permanent Mandibular Second Premolar
 7. Fluorosis of teeth
 8. Saliva control in dentistry

9. Differences between maxillary First and Second Premolars



GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
**DIPLOMA IN DENTAL OPERATING ROOM ASSISTANCE COURSE REGULAR
EXAMINATION APRIL 2022**

DORA-S-I-APRIL-2022

Time: 3hrs.

Max.Marks: 75

PART-II PAPER-II

**OPERATING ROOM TECHNIQUE, CHAIR SIDE ASSISTANCE AND DENTAL LAB
ROUTINE**

(Answer all questions .Answer Section-A, B and C-Separately, Draw diagrams wherever
necessary)

SECTION -A

ESSAY

- I. Classify impression materials? Describe in detail about thermal properties and manipulation of impression compound? (2+2+4=8)
- II. Classify Acrylic Resins? What are the uses of Acrylic Resins? Write about the curing cycle for polymerization of Heat cure acrylic? (1+2+4=7)
- III. **WRITE SHORT NOTES** (2x5=10)
 - a. Manipulation of zinc oxide eugenol
 - b. Procedure for pouring stone cast from alginate impression

SECTION -B

ESSAY

- I. What are aesthetic restorative materials. Write about dental composites and the role of DORA in its placement (2+3+5=10)
- II. **Write short notes on:** (3x5=15)
 - a. Mercury toxicity and mercury hygiene
 - b. Gold foil
 - c. Setting reaction of Glass ionomer cement

SECTION C

- I. **Writ short notes on** (5x5=25)

- a. Control of cross-infection in dental practice
- b. Autoclaving
- c. Pre-operative preparation of a patient in an out-patient clinic.
- d. Management of Syncope
- e. Electrocautery



GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
**DIPLOMA IN DENTAL OPERATING ROOM ASSISTANCE COURSE REGULAR
EXAMINATION APRIL 2022**

DORA-S-III-APRIL 2022
Max.Marks:75

Time: 3 hrs.

Part-II Paper -III

**MINOR AND MAJOR SURGICAL ASSISTANCE, WITH CONCEPT OF BTLS
RADIOIMAGING, DENTAL ETHICS AND JURISPRUDENCE & ORIENTATION IN
DENTISTRY**

(Answer all questions , Answer Section A, B and C- Separately.
Draw diagrams wherever necessary)

SECTION-A

ESSAY

- I. Explain the characteristics of zygoma fractures. Write in detail about the preparation of a patient with fractured zygoma for open reduction and rigid internal fixation under general anaesthesia. Enumerate the instruments required for the procedure (5+5+5=15)
- II. Operation theatre techniques and present concept in assistance (10)
- III. Write short notes on : (5x5=25)
 - a. Control of cross-infection in dental practice
 - b. Electrocautery.
 - c. Sequencing of review of post-trauma patients
 - d. Airway maintenance in trauma.
 - e. Duties of DORA

SECTION -B

- I. Write short note on (5x3=15) a.
 - a. Consumer Forums
 - b. Confidentiality
 - c. Informed consent

SECTION -C

- I. Write short notes on (2x5=10)

a. Collimation

b. Units of radiation measurement.

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Syllabus of Diploma Courses

Conducted by Directorate of Medical Education,

Medical College PO, Thiruvananthapuram

Course Code :PMD-10

DiplomaIn Respiratory Technology [DR]

1. COURSE CONTENT

I		
1.1	Title of the course	<u>DiplomaIn Respiratory Technology [DR]</u>
1.2	Aim of the course	Diploma in Respiratory Technology provides an educational forum responsive to the needs of the health care community with emphasis to maximize professional potential and foster the development of competent and compassionate respiratory care technicians. These technicians are essential to provide optimum care in respiratory intensive care and respiratory laboratory. They will look after bed side care of ventilated patients; look after the interfaces and machines. They should also assist the physician in teaching inhalational techniques, nebulization, oxygen therapy and rehabilitation techniques. These technicians also provide assistance in spirometry, arterial blood gas analysis and cardiopulmonary exercise testing.
1.3	Objective of the Course	<p>Upon completion of this course each student should be able to:</p> <ul style="list-style-type: none">❖ Evaluate the clinical need for artificial airways.❖ Compare and contrast the different techniques used to maintain patent airways in patients with airway obstruction.❖ Describe the circumstances requiring airway suctioning.❖ Demonstrate appropriate communication skills and behaviors when fellow students, Physicians, Instructors and other health care providers.❖ Identify major structures of the upper airway.❖ Recommend appropriate therapy based on the patient assessment.❖ Evaluate patient outcome and recommend modification to respiratory care plan, as indicated.❖ Compare and contrast the various infection control methods used in respiratory care equipment.❖ Differentiate the special categories of patient isolation, including acceptable modification of these precautions.❖ Apply basic Physics to the practice of respiratory care.

		<ul style="list-style-type: none"> ❖ Analyze arterial blood gas results and make appropriate ventilatory changes. ❖ Identify, describe and recommend appropriate respiratory care procedures and equipment to be used in the support and treatment of cardiopulmonary disorders. ❖ Demonstrate laboratory and clinical proficiency in selection, assembly, application, monitoring and troubleshooting various pieces of respiratory therapy equipment. ❖ Demonstrate laboratory competency by successfully completing the following performance evaluations: <ul style="list-style-type: none"> ○ Arterial Blood Gas Sampling ○ Nasotracheal Suctioning ○ Endotracheal Suctioning ○ Tracheostomy Suctioning ○ Nebulizer Therapy ❖ Demonstrate Clinical Competency by successfully completing the following performance evaluations: <ul style="list-style-type: none"> ○ Adult Floor Therapy Competencies: <ul style="list-style-type: none"> ▪ Oxygen Therapy ▪ Transport with Oxygen ▪ Ultrasonic Nebulizer ▪ Incentive Spirometry ▪ Chest Physiotherapy ▪ Assisted coughing ▪ Breathing Exercises ▪ Mucous Clearing (Flutter, PEP) ○ Adult Diagnostics <ul style="list-style-type: none"> ▪ Spirometry ▪ Diffusion Study ▪ Arterial Blood Gas Sampling ▪ Arterial Blood Gas Analysis ▪ Cardiopulmonary exercise testing ▪ Polysomnography ▪ Assisting bronchoscopy ○ Pediatric Floor Competencies: <ul style="list-style-type: none"> ▪ Incentive Spirometry ▪ Chest Physiotherapy ▪ Mucous Clearances Adjunct (Flutter, PEP) ▪ Oxygen Therapy ▪ Transport with Oxygen ▪ Aerosol Face Mask ▪ Ultrasonic Nebulizer ❖ Demonstrate laboratory clinical proficiency in selection, assembly, application, monitoring and troubleshooting various pieces of respiratory therapy equipment.
1.4	Medium of instruction	English
1.5	Duration	The duration of the course shall be 2 years and 6

		months of internship(nonstipendary practical training). The course shall be conducted under the department of Respiratory Medicine. There shall be theory classes along with practical training and resident day and night duty during the course.
1.6	Academic eligibility	A pass in the Higher Secondary Examination of the Board of Higher Secondary Education of Kerala or equivalent examinations conducted by any board in India recognized by any of Universities in Kerala with Physics, Chemistry and Biology as optional subjects and a pass with 40% marks in Physics, Chemistry and Biology put together, are eligible. Relaxation of 5% marks will be allowed to SC/ST candidates.
		Indian citizen of Kerala origin is eligible for admission.
		The Candidate should be above the age group of 17 years
1.7	Strength/batch	Not to exceed 4 students per batch
1.8	Reservation	As per existing Government guidelines
1.9	Admission requirement	Selection to the course shall be made by the Director of Medical Education. Selection will be made on merit basis and based on the marks obtained in the qualifying examination. Selection to the management quota in the self-financing institution where the Course is granted and approved by the Government of Kerala, shall be made by the respective management with transparency.
1.10	Subjects of study	
1.10.1	First Year (PART-I)	
		Basic Science, Pulmonary function Tests, Respiratory Therapeutics
		Airway Management Aerosolisation, Mechanical Ventilation, Incentive spirometry, Pulmonary rehabilitation, other respiratory Therapy
1.10.2	Second year (PART-II)	
	Paper-1	Basic Science, Pulmonary function Tests, Respiratory Therapeutics
	Paper-2	Airway Management Aerosolisation, Mechanical Ventilation, Incentive spirometry, Pulmonary rehabilitation, other respiratory Therapy

2. DISTRIBUTION OF HOURS

PART-1-FIRST YEAR		
A	Section A	Hrs
A	Basic Science	
1	Anatomy	10
2	Physiology	10
3	Microbiology	10
4	Pharmacology	10

B	Basic Life support	5
C	Assessment of vital signs	5
D	Assessment of common Respiratory Symptoms	5
E	Common Respiratory diseases	5
	TOTAL	60
	GRAND TOTAL	

Part II

	2.4	
	Part-II: Paper-1	
		Hrs
1	Diagnostic Techniques in Respiratory Diseases	20
2	Respiratory Therapy Techniques	20
3	Critical care	20
11		
12		
	GRAND TOTAL	60

3. DETAILED SYLLABUS

3.1 FIRST YEAR

3.1.1 Basic Sciences

Anatomy

- Anatomy of the upper respiratory tract, tracheobronchial tree, lungs and pleura
- Surface marking of the lungs
- Microscopic structure of lungs
- Mucociliary escalator
- Blood vessels and lymphatic drainage of lungs
- Anatomy of the chest wall
- Muscles of Respiration
- Anatomy of the heart, pericardium and great vessels

Physiology

- Functions of upper respiratory tract
- Mechanics of ventilation – pressure differences during breathing, compliance, airway resistance
- Work of breathing
- Distribution of ventilation, V/Q ratio, Dead space ventilation
- Transportation of gases- O₂, CO₂, and Dissociation curves
- Pulmonary gas exchange, Respiratory membrane, Diffusion capacity
- Hypoxia, Cyanosis
- Neural and chemical control of respiration
- Lung volumes and Capacities
- Pulmonary circulation
- Surfactant
- Non-respiratory functions of lung
- Dyspnoea, abnormal breathing patterns

- Conducting system of the heart
- Cardiac cycle, cardiac output
- Cardiac rhythm, ECG
- Pulse, Blood pressure
- Heart sounds

Microbiology

- Sterilisation and disinfection
- Sources of infection and modes of transmission
- Nosocomial infections
- Standard precautions
- Common bacterial and viral infections of respiratory system

Pharmacology

- Routes of drug delivery
- Aerosol therapy
- Bronchodilators- Theophyllines, Beta 2 agonists, Anticholinergics
- Leukotriene modifiers
- Corticosteroids including inhaled corticosteroids
- Mucolytics

B) Basic Life Support

Reference: www.aclsmedicaltraining.com

C) Assessment of vital signs and common respiratory symptoms

Reference: Hutchison's Clinical Methods: An integrated approach to clinical practice

Common respiratory diseases

- Obstructive Lung Diseases- COPD, Asthma, Bronchiectasis
- Airway Pharmacology
- Suppurative Lung Diseases
- Chest wall and neuromuscular diseases
- Pleural diseases
- Pneumonia- Community acquired and hospital acquired
- Pulmonary Tuberculosis
- Sleep disordered breathing
- Reference: Davidson's Principles and Practice of medicine

3.2 SECOND YEAR-PART II

Diagnostic Techniques in Respiratory Diseases

- Arterial Blood Gas sampling and interpretation
- Pulseoximetry
- Capnography
- Spirometry
- Bronchial provocation tests
- DLCO
- PEF, Bedside PFT
- 6MWT
- Cardiopulmonary exercise testing
- Overnight Polysomnography
- Basics of Flexible fibre optic bronchoscopy and care of bronchoscope, Medical Thoracoscopy

Respiratory Therapy Techniques

- Oxygen therapy- storage systems, oxygen flow meters, oxygen delivery systems, high flow nasal cannula, hyperbaric oxygen therapy, oxygen toxicity
- Aerosol Therapy- MDI,DPI, Ultrasonic and jet nebulisers
- Intercostal drainage
- Incentive Spirometry
- Bronchial hygiene therapy
- Pulmonary Rehabilitation

Critical care

- ARDS
- Respiratory failure
- Humidification- HME, heated humidifiers
- Airway Suctioning
- Artificial Airways- Pharyngeal airways, Endo tracheal tubes and difficult intubation, Care of tracheostomy patients
- Bag-valve masks
- Non-invasive ventilation (CPAP, BiPAP, Interfaces, Indications, Contra indications, Setting up NIV, Monitoring, Complications)
- Invasive mechanical ventilation
- (Initiation of Mechanical ventilation, Modes of mechanical ventilation, Monitoring during mechanical ventilation, Care of patients with mechanical ventilation. Troubleshooting during mechanical ventilation, Complications during mechanical ventilation, Weaning during mechanical ventilation, PEEP, Auto PEEP, Weaning criteria, Post extubation care, Lung recruitment maneuvers, Prone Ventilation)
- Paediatric respiratory care
- Transport of Critically ill patients
- Extra Corporeal Membrane Oxygen Therapy

4. SCHEME OF TEACHING AND CLINICAL TRAINING

First Year :

Second Year:

Year	Subject	No of Hrs
First Yr	PART-I	
	Theory	
	a. Anatomy,physiology	50
	b. Microbiology,pharmacology	50
	c. Common respiratory diseases Basic Life support	100
	Practical & Posting	

	a. Vital signs, clinical examination	100
	b. ABG, spirometry	200
	c. Common respiratory diseases, Pulmonary rehabilitation	500
	TOTAL HRS	1000
Second Yr	PART-II	
	Theory	
	a. Diagnostic Techniques in Respiratory Diseases	50
	b. Respiratory therapy techniques	50
	c. Critical care	100
	Practical & Posting	
	d. Diagnostic Techniques in Respiratory Diseases	250
	e. Respiratory therapy techniques	250
	a. Critical care	300
	TOTAL HRS	1000
	GRAND TOTAL	2000

- 1.1 Records
- 1.2 Log Book
- 1.3 Seminars

5 **TEACHING /LEARNING AIDS**

5.1 Books / reference books prescribed

Anatomy

1. B.D Chaurasia's, Human anatomy Regional and applied Volume – 1,3 CBS Publishers and distributions New Delhi.

2. Richard S Snell, Clinical Anatomy for Medical students, Little, Brown and company, U.S.A.

Physiology

3. Hutchison's Clinical Methods: An integrated approach to clinical practice

4. Davidson's Principles and Practice of medicine

5. Egans Fundamentals of Respiratory care

5.2 Models/Charts: models or charts demonstrating anatomy of lung, bronchopulmonary segments, pulmonary rehabilitation exercises, chest physiotherapy

6.1 Scheme of internal assessment –Regular internal assessment through written & practical exam shall be conducted. Minimum of 3 internal assessment & one model exam are to be conducted & average of these marks are to be tabulated and presented to the DME before the final examination.

6.2 Final examination

6.2.1 The Authority to conduct the examination:

The Director of Medical Education, Government of Kerala

6.2.2 Frequency

Regular examination shall be conducted at the end of the 2nd years. Only internal examination in the first year.

Supplementary examination shall be conducted 6 months after the regular examination.

6.2.3 Eligibility

- a. Minimum of 80% attendance in theory & practical is required to appear for the final exam.
- b. Certificate of satisfactory completion of the course by the Course Director or Head of Department/Institution.

6.2.4 Schedule of Exam

- a. Regular examination shall be conducted at the end of the second academic year which includes theory, practical & Viva voce
- b. Total 2 Papers (-2 papers in the 2nd year)
- c. Each paper shall be of duration of 3 hours with total marks of 100 each. Each paper shall have 2 sections- Section A & Section B.

DIPLOMA IN RESPIRATORY TECHNOLOGY PRACTICAL FORMAT

1. Viva – 100 marks
2. Practicals – 100 marks

Practicals - 2 sessions

1. OSCE – 50 marks
2. Spotters – 50 marks

OSCE – 1 Steps of spirometry and interpretation

2. steps of pulmonary rehabilitation
3. steps of performing chest physiotherapy
4. steps of performing ABG and its analysis
5. care of bronchoscope or preparation for endotracheal intubation

Spotters -niv mask, humidifier, oxygen delivery devices, artificial airways etc

6.3 Examiners

Faculty with post PG teaching experience of minimum of 3 years in the concerned course/subject is eligible to be an examiner

6.4 Pass Criteria

Minimum of 45% of marks in each theory paper with a minimum of 50% of marks in the total theory paper and internal and a minimum of 40% of marks in the oral. minimum of 50% of marks for practical exam with a minimum of 50% aggregate marks of the grand total (Total theory, practical and internal assessment)

Second year examination - 250 out of 500

The pass certificate shall be issued only on completion of 6 months internship (non stipendary practical training)

6.5 First class/Distinction/Rank

Candidates scoring not less than 65% & above shall be awarded first class. Candidates scoring 75% & above shall be awarded distinction. Candidates who scores highest mark in the grand total (Theory, practical and internal assessment) in the regular examinations shall be awarded the first Rank.

Any candidate who requires revaluation shall submit the request to do so within 14 days of the official declaration of the result.

7 MODEL QUESTION PAPERS

GOVERNMENT OF KERLA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN RESPIRATORY TECHNOLOGY COURSE REGULAR/SUPPLY EXAMINATION
APRIL 2022

Time.3hrs

DR-S-II-APRIL 2022
Max. marks : 100

PAPER - I

BASIC SCIENCES, PULMONARY FUNCTION TESTS & THERAPEUTICS

SECTION- A

- I. Write Briefly on. (5x10=50)
- a. Bronchodilator reversibility testing
 - b. Primary acid base disorders
 - c. Limitations of pulse oximetry
 - d. Management of COPD exacerbation
 - e. Indications and contra indications for spirometry

SECTION - B

- II. Write Briefly on. (5x10=50)
- a. Short acting beta 2 agonists
 - b. Lung compliance

- c. Bronchopulmonary segments
- d. Alveolar capillary membrane
- e. Hand hygiene

GOVERNMENT OF KERLA
DIRECTORATE OF MEDICAL EDUCATION
DIPLOMA IN RESPIRATORY TECHNOLOGY COURSE REGULAR/SUPPLY EXAMINATION
APRIL 2022

Time.3hrs

DR-S-II-APRIL 2022
Max. marks : 100

PAPER - II

(Airway management, Mechanical ventilation, Incentive spirometry, Aerosolisation, Pulmonary rehabilitation & other respiratory therapy)

SECTION- A

- I. Write Briefly on. (5x10=50)
- a. Steps in endotracheal intubation
 - b. Low tidal volume ventilation strategy
 - c. Define respiratory failure, Differentiate between type 1 and 2 respiratory failure
 - d. Pressure support ventilation.
 - e. CPAP ventilation

SECTION – B

- II. Write Briefly on. (5x10=50)
- a. Hazard of oxygen

- b. Types of nebulizers
- c. Obstructive sleep apnoea
- d. High flow oxygen delivery devices
- e. Incentive spirometry

Syllabus of Diploma Courses

Conducted by Directorate of Medical Education,

Medical College PO, Thiruvananthapuram

Course Code :
PMD- 11

DIPLOMA IN CENTRAL STERILE SUPPLY TECHNOLOGY (DCSST)

1. COURSE CONTENT

1		
1.1	Title of the course	Diploma in Central Sterile Supply Technology (DCSST)
1.2	Aim of the course	1. To provide state of the art services in sterilization in health care institutions 2. To facilitate strengthening of infection control practices and to prevent health care associated infections.
1.3	Objective of the Course	On completion of the Two Year DCSST Course , the Diploma Holder will be able to 1. To train and develop skilled technologists in the area of sterile services. 2. To impart research basis to validate techniques during professional practice towards quality care of health care delivery. 3. To develop appropriate professional relationships in multi-disciplinary set up to provide total care. 4. To update the students with recent evidence in professional practice and provide them opportunities to think, reason and practice towards excellent care. 5. To achieve skills in surgical instruments handling and its reprocessing techniques. 6. To train the candidates to execute professional practice through professional ethical code. 7. Demonstrate critical thinking skills in making decisions in all situations in order to provide quality care. 8. Utilize the latest trends and technology in providing health care. 9. Provide promotive, preventive, and restorative health services in line with the National Health Policies and programs. 10. Practice within the framework of code of ethics and professional conduct, and acceptable standards of practice within the legal boundaries. 11. Communicate effectively with individuals and groups, and members of the health team in order to promote effective interpersonal relationships and team work. 12. Participate effectively as members of the health team in the health care delivery system. Demonstrate leadership and

		managerial skills in clinical/community health settings.
1.4	Medium of instruction	English
1.5	Duration	<p>The duration of the course shall be 2 years and 6 months internship. The maximum period to complete the course successfully shall not exceed four years.</p> <p>The course shall be conducted under the Department of Microbiology and Department of CSSD. There shall be theory classes along with practical training and resident duty during the course.</p>
1.6	Academic eligibility	<p>A pass in the Higher Secondary Examination of the Board of Higher Secondary Education of Kerala or equivalent examinations conducted by any board in India recognized by any of Universities in Kerala with Physics, Chemistry and Biology as optional subjects and a pass with 40% marks in Physics, Chemistry and Biology put together, are eligible. Relaxation of 5% marks will be allowed to SC/ST candidates.</p> <p>Indian citizen of Kerala origin is eligible for admission.</p> <p>The Candidate should be in the age group of 17-25 years. 5 years relaxation in the upper age limit for SC/ ST candidates is allowable.</p>
1.7	Strength/batch	4 seat/batch
1.8	Reservation	As per existing Government guidelines
1.9	Admission requirement	Selection to the course shall be made by the Director of Medical Education. Selection will be made on merit basis and based on the marks obtained in the qualifying examination. Selection to the management quota in the self-financing institution where the Course is granted and approved by the Government of Kerala, shall be made by the respective management based on academic merit ensuring transparency in the admission process.
1.10	Subjects of study	
1.10.1	First Year (PART-I)	
	Paper-1	<p>A. Basic Anatomy</p> <p>B. Basic Physiology</p> <p>C. Basic Pathology</p>
	Paper-2	Basic Microbiology
	Paper-3	Sterilization and disinfection
	Paper-4	Engineering aspect, Inventory management, CSSD administration, Computer fundamentals
1.10.2	Second year (PART-II)	
	Paper-1	Processing of Medical Devices
	Paper-2	Health care associated infection & infection control procedures
	Paper-3	Quality assurance in CSSD process
	Paper-4	Packaging, Storage and Supply

2. DISTRIBUTION OF HOURS

2.1 First Year PART-I - PAPER-I

BASIC ANATOMY, PHYSIOLOGY AND PATHOLOGY

Basic Anatomy deals with structure as well as relationship between different body parts, Whereas basic Physiology describes the functions of different body parts, their mechanism and regulations for the normal physiological activities. The basic Pathology deals with various causes and effects of disease or injury and malignancy.

Time Allotted: 44hrs

- Basic Anatomy :16hrs
- Basic Physiology: 16hrs
- Basic Pathology: 12hrs

2.1.1	Part-1: Paper-1 <u>BASIC ANATOMY, PHYSIOLOGY AND PATHOLOGY</u>		
Mod ule	Learning objective	Hours	Contents
A	Section A - Basic Anatomy		
1	Basic anatomy of cell	1	Cell & cell division
2	Characterisation of components in various tissues and morphology by slide demonstration	6	Tissues Epithelial cells including glands Connective tissue Cartilage and bone Muscle & lymphatics Vascular tissue Nervous tissue
3	Anatomic concept of various organs/system and demonstration using models/specimens	9	Respiratory Cardiovascular Nervous Gastrointestinal Excretory & reproductive system
	TOTAL	16hrs	
B	Section B-Basic Physiology		
1	Haematology	4	RBC-functions, normal & abnormal values, Anaemia-definition & classification WBC -Types, properties, functions, normal & abnormal values, Immunity Platelet-count, functions, haemostasis Blood group- ABO, Rh types Blood transfusion, complications Lymphatics Plasma protein
2	Cardiovascular system	3	Heart & vascular structure, systemic & pulmonary circulation, components of conducting system. Heart rate- normal & abnormalities, Blood pressure-Definition, normal & abnormalities Cardiac output & cardiac failure
3	Respiratory System	2	Components-Tracheo bronchial

			tree, respiratory and conducting zone, Functions of lung, normal rate and dyspnoea, surfactant, respiratory membrane, hypoxia, forms of gas transport
4	Gastrointestinal system	2	Components, enteric nervous system Gastrointestinal secretions-names & functions (saliva, gastric juice, pancreatic juice, bile, Succus entericus); liver & biliary system, nutrition and metabolism
5	Excretory system	1 1/2	Nephron-Structure, Mechanism of urine formation, micturition, Dialysis
6	Endocrine & Reproductive system	1 1/2	Major endocrine glands- hormones produced and its actions. Functions and abnormalities Male and female reproductive system -functions
7	Nervous system	2	Organisation and functions of nervous system synaptic transmission, special senses- vision, audition, temperature regulation
	TOTAL	16 hrs	
C	Section C-Basic Pathology		
1	Introduction to pathology	1	
2	Inflammation and repair	3	Cardinal signs of inflammation Steps of inflammation Types of inflammation Chemical mediators (brief) Morphologic features of inflammation Outcomes of inflammation Systemic effects of inflammation Repair
3	Haemo dynamic disorders	1	Oedema and effusions Basic haemostasis Thrombosis- Virchows triad Septic shock
4	Basics of Neoplasia	1	Benign and malignant tumours- definition and basic differences including spread
5	Microbial infections- in brief	4	Routes of microbial infection Viral infections- common Bacterial infections-common Sexually transmitted infections Mycobacterial infections Common fungal infections Common parasitic infections- brief
6	Clinical pathology	2	Basic haematological tests and urine examination Brief mention of investigation of other fluids- CSF, sputum, semen, effusion
	TOTAL	12 Hrs	

	GRAND TOTAL	44 Hrs	
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2.1.2 TEXT BOOK/REFERENCES:

1. Basics in human anatomy (for BSc Paramedical course)
Priya Renganath, Suruchisinghal, Leelavathy N, Vani Vijay Rao, Roopa R
2. Text book of physiology for nursing-N. Geetha
3. Robbin’s pathologic basis of disease

2.2 FIRST YEAR – PART-1 - PAPER II

BASIC MICROBIOLOGY

Basic Microbiology designed to reorient the students to the fundamentals of Microbiology and its various sub- divisions. It comprehends microorganisms and their role in human health and diseases, diagnosis, treatment and prevention of various infectious diseases. Also discuss the basic infection control practices that has to be routinely followed to prevent health care associated infections.

Time Allotted: 35hrs

Theory: 30hrs

Practical:5 hrs.

Part II

2.2.1	Part-I: Paper-II BASIC MICROBIOLOGY		
Module	Learning objective	Hrs	Contents
1	Basics of microbiology	10	Introduction to Microbiology Morphology of bacteria
	Staining methods		Gram staining, Acid Fast staining, negative staining.
	Growth& nutrition of micro Organisms		Bacterial growth curve Culture media & methods (in brief)
	Biofilm		Formation of bio film and its importance Infection-Types, modes of transmission and epidemiological pattern. Source, carrier, reservoir Endotoxin and Exotoxin
	Infection		
	Bacterial toxins		
	Health care associated Infection		HCAI-types. Infection control measures standard& transmission-based precautions (in brief)
	Immunity		Innate& acquired immunity (briefly)

			Immuno prophylaxis
			Bacteriology of air, water and surfaces
2	Environmental surveillance		
	Systematic Bacteriology	13	Disease producing micro- organisms. Gram positive cocci: Staphylococcus, Streptococcus, Enterococcus Spore forming bacilli-- [Aerobes (Bacillus) Anaerobes (Clostridium- classification, Cl. tetani, Cl. difficile, Cl. perfringens)] Mycobacterium tuberculosis and Atypical Mycobacteria Gram negative bacilli Enterobacteriaceae (E. coli, Klebsiella, Proteus) Non fermenters (Pseudomonas, Stenotrophomonas, Acinetobacter, Burkholderia, Ralstonia) Campylobacter, Helicobacter, Legionella Multidrug resistant organisms (MDRO)
	Normal microbial flora		Normal flora of human body
3	Virology	5	Classification and general character of Viruses (in brief) Hepatitis viruses HIV Influenza viruses, Nipah virus, Corona virus, Slow viruses & Prions
4	Mycology	1	Classification Opportunistic mycosis Candida, Penicillium, Aspergillus, Zygomycetes
5	Parasitology	1	Awareness on parasitic infection - Mention name of important human parasite and infections
	TOTAL	30	
	GRAND TOTAL		

2.2.2 TEXT BOOK/REFERENCES:

1. Ananthanarayan R & Jayaram Paniker C K (2005). Text Book of Microbiology, Hyderabad, Orient Longman Private Ltd

2.3 FIRST YEAR – PART-1 - PAPER III

STERILIZATION & DISINFECTION

Defines the process of cleaning, sterilization, disinfection, and packing instructions while handling medical & surgical devices. Explain and practise the delivery of sterile equipment to various departments as per needs. Discuss the merits of infection control and practices to maintain it.

Time Allotted:25hrs

Theory: 20hrs

Practical:5hrs

2.3.1	Part-I: Paper-III <u>STERILIZATION & DISINFECTION</u>		
Module	Learning objective	Hrs	Contents
1	Decontamination and cleaning	8	Definition & methods by which decontamination and cleaning of instruments can be done Discuss the factors that impact Sterilization Spaulding
	Sterilization		High Temperature methods Low temperature methods Chemical sterilant, gaseous methods, radiation, bacterial filters Monitoring the efficacy of sterilization Decontamination of Prion contaminated devices and surfaces
2	Disinfection	7	Concept of disinfection Disinfection policy Discuss the commonly used disinfectants, uses, advantages and disadvantages, disposal of disinfectants -High level disinfectants -Intermediate level disinfectants -Low level disinfectants Disinfectant testing
3	Sterilization& Disinfection of various medical/Dental devices	3	Endoscopy transmitted infections Reprocessing of devices like endoscope Disinfection in Haemodialysis unit Reuse of SUDs
4	Cleaning of environmental surfaces	2	General cleaning practices Cleaning of environmental surfaces of wards, ICUs Cleaning and fumigation of operating room
	TOTAL	20	

2.3.2 TEXT BOOK/REFERENCES:

1. Essentials of Hospital infection control- Apurba s Sastry, Deepashree
2. CDC-Guideline for disinfection & sterilization in healthcare facility
3. Hospital acquired infection- prevention and control-Purva Mathur
4. Central Service technical Manual -8th edition IAHCSMM
5. The basics of Sterile Processing-6th edition by Nancy Chobin

2.4 First Year: - PART-1 - PAPER – IV

**ENGINEERING ASPECT, INVENTORY MANAGEMENT, CSSD
ADMINISTRATION, COMPUTER FUNDAMENTALS**

Discuss the various engineering aspects related to CSSD and equipment maintenance, CSSD structure, lay out and importance in documentation, Inventory stock maintenance and gain understanding about application of computers with basic foundation to computers, need of Operating systems (OS), e-Health, Hospital Information System (HIS)

- Time Allotted :40hrs
- Engineering aspect :10hrs
- Inventory management:10hrs
- CSSD Administration: 10hrs
- Computer fundamentals:12hrs

2.4.1	<u>PART-I PAPER-IV ENGINEERING ASPECT, INVENTORY MANAGEMENT, CSSD ADMINISTRATION, COMPUTER FUNDAMENTALS</u>		
Module	Learning objective	Hrs	Contents
1	ENGINEERING ASPECT	10	Engineering aspects of various Equipments -Autoclave, ETO, Sterrad, Ultrasonic cleaner CSSD Equipment maintenance service Heating, ventilation and air conditioning (HVAC)-NABH2018 Parameters like Temperature, humidity, air velocity of OT HEPA filters & Validation check of HEPA filter, Ventilation specification
2	INVENTORY MANAGEMENT Inventory stock maintenance	10	Inventory control guideline Inventory management of reusable surgical supplies and presterilized items CSSD management module CSSD-Planner -Planning and Control for the Sterile Supply Chain Importance of keeping record of manufacturing and expiration
	Inventory replenishment and distribution systems		Cycle of distribution of supplies
3	CSSD ADMINISTRATION	10	
	Central Sterile Service Department-Functions		Structure, location and Lay out of CSSD Workflow of CSSD Accessory areas Specification of environmental Parameters of CSSD Employees responsibilities e.g. punctuality, discipline, integrity, grievance redressal process
	Documentation and record		Documentation and maintenance of

	keeping		<p>proper registers related to CSSD function</p> <p>Process involved intake and delivery of articles</p> <p>Handling of sterile equipment.</p> <p>Prepare complete surgical sets as per the requirement of the operating surgeons</p> <p>Handling various machines and sterilizers of CSSD</p> <p>Awareness for performing basic first aid in case of emergencies</p>
4	COMPUTER FUNDAMENTALS	12	
	Computers- hardware & software		<p>Introduce with basic foundation to Computers:</p> <p>Basic parts and its functions</p> <p>Formulating & deleting files, changing password, formatting, trouble shooting, configuring start up program</p> <p>Input and Output devices Storage devices, hardware and software, installing programs and drivers</p> <p>Backup and restore</p>
	Disc operating system (DOS)		<p>Discuss the foundation concept of operating systems, Need of Operating systems (OS) Functions of OS</p> <p>Windows 2000 – Utilities and basic operations, Microsoft office 2000 – MSWord, MS Excel, office</p>
	Multimedia		<p>Multimedia- type & uses</p> <p>Computer aided teaching & testing</p> <p>Power point presentation</p>
	internet and e-mail		<p>Use of internet & e-mail</p> <p>Set up internet connection-mail and attachment, default</p>
	e-Health		<p>e-Health, Hospital Information System (HIS)/ Health management information system Application of computer in hospitals</p>

2.4.2 TEXT BOOK/REFERENCES:

1. Dheenadayal R Computer science, vol I&II , New Delhi, Tata MC Graw Hill publishing company Ltd
2. Goel M K Introduction to computer Science. New Delhi, Sterlin publishers Pvt Ltd
3. Jain P and Kumari N introduction to computers for nursing , Jalandhar, S VikasCo
4. Vikas Guptha. Condex Computer course Kit, New Delhi, Dreamtech press
5. Essentials of Hospital infection control- Apurba S Sastry, Deepashree
- 6 Central Service Technical Manual -8th edition IAHCSMM
- 7.The basics of Sterile Processing-6th edition by Nancy Chobin

PROCESSING OF MEDICAL DEVICE

Comprehend the concept of reprocessing of medical devices and the importance in preventing healthcare associated infections. Describes the way how commonly used medical & surgical devices are sterilized/ disinfected. Also discuss the reuse of single use devices in special situations and reuse protocol.

- Time Allotted :15hrs
- Theory :10hrs
- Demonstration: 5 hrs

2.5.1	<u>SECOND YEAR-PART- II PAPER – I</u>		
	<u>PROCESSING OF MEDICAL DEVICE</u>		
Module	Learning objective	Hrs	Contents
1	Care for instruments	2	Apply standard operating procedures for care of instruments including surgical & non-surgical Inspection & function testing Sort items according to type, size and density for appropriate packaging material and method & inspect items for cleanliness, dryness and reprocess
2	Pre cleaning at the point of use	2	Cleaning products & methods Transportation
3	Types of surgical instruments and speciality devices	4	Describe the classes and categories of various surgical, orthopaedic, spinal, dental devices, powered surgical instruments-electric, pneumatic and battery powered & various endoscopes Instrument sharpness testing and oil lubrication
	Reprocessing of common Medical/surgical devices		Steps of processing equipments Cleaning of medical devices in CSSD cleaning products & procedures as per equipment-manual and automated Sterilisation/disinfection of common medical/ dental devices Endoscopy reprocessing & endoscopy transmitted infections
4	Single use devices (SUDs)	2	Types, Reasons for reprocessing

			SUDs, steps of reprocessing, reuse protocol
	TOTAL	10	

2.5.2 TEXT BOOK/REFERENCES:

1. Essentials of Hospital infection control- Apurba s Sastry, Deepashree
2. CDC-Guideline for disinfection & sterilization in healthcare facility
3. Hospital acquired infection- prevention and control- Purva Mathur
4. Central Service technical Manual -8th edition IAHCSMM
5. The basics of Sterile Processing-6th edition by Nancy Chobin

2.6 Second Year – PART –II Paper-II

HEALTH CARE ASSOCIATED INFECTION & INFECTION CONTROL PROCEDURES

Comprehend basic knowledge on different types of healthcare associated infections
Importance of standard infection control guidelines to reduce risk of infection. Describe policies& procedures related to sterile department such Operation Theatres, CSSD Departments, Intensive Care Unit etc., Explain the importance of proper and safe disposal of bio-medical waste & treatment

Time Allotted: 15hrs Theory: 12hrs Demonstration: 3hrs

2.6.1	<u>Second Year – PART –II Paper-II</u>		
	<u>HEALTH CARE ASSOCIATED INFECTION & INFECTION CONTROL PROCEDURES</u>		
Module	Learning objective	Hrs	Contents
1	Hospital infection control committee (HICC)	3	Structural organisation of infection control program& responsibilities-HICC
	Major HCAs		Definition, epidemiological triad, modes of transmission, agents causing HAI Major HCAs and preventive measures including bundle care approach (in brief)
2	Standard precaution	3	Standard precaution -components Hand hygiene Personal protective equipment Safe management of care equipment Safe management of care environment Safe management of linen Management of blood spill Waste management in healthcare facility Needle stick injury -Occupational safety and prevention of infectious hazard-including PEP
	Transmission based precaution		Transmission based precautions (specific precautions)

			Types, agents & infection control measures in each situation
3	IPC in special situations	4	IPC in special situations Operation room, ICU, Dialysis Engineering controls for prevention of HCAI Outbreak investigation
4	Awareness on antimicrobial Resistance	2	Epidemiologically important multidrug resistant organisms

2.6.2 TEXT BOOK/REFERENCES:

1. Essentials of Hospital infection control- Apurba s Sastry, Deepashree
2. CDC-Guideline for disinfection & sterilization in healthcare facility

2.7 SECOND YEAR –PART – II PAPER - III

QUALITY ASSURANCE IN CSSD PROCESS

Enhance awareness of the responsibilities to maintain health safety & security. Explain the importance of quality assurance and quality control in CSSD.

- Time Allotted :15hrs
- Theory: 12hrs
- Practicals: 3hrs

2.7.1	<u>SECOND YEAR –PART – II PAPER - III</u> <u>QUALITY ASSURANCE IN CSSD PROCESS</u>		
Module	Learning objective	Hrs	Contents
1	Quality Assurance in CSSD department	5	Quality assurance for CSSD equipment & quality control within CSSD Monitoring devices and safety aspects of sterilization process
2	Quality control in various steps	5	Cleaning verification and quality Control
	Sterilization controls		Indicators for monitoring efficacy of different methods of sterilization- chemical & biological indicators
	Disinfectant testing		Different methods for testing Disinfectants
3	Analysis of quality concerns		Documentation related to safety & security Planning tools and procedures

2.7.2 TEXT BOOK/REFERENCES:

1. Essentials of Hospital infection control- Apurba s Sastry, Deepashree
2. Central Service technical Manual -8th edition IAHCSMM
3. The basics of Sterile Processing-6th edition by Nancy Chobin

2.8 Second Year PART- II - Paper IV PACKAGING, STORAGE & SUPPLY

Explain maintaining, packaging with integrity, labelling & batch control of sterile stock.
Describes selection of packaging materials and technique with reference to sterilisation mode Also explain and practise the delivery of sterile equipments to various departments as per needs.

Time Allotted – 20hrs :

Theory - 15hrs

Practical -5 hrs.

2.8.1 Second Year PART- II - Paper IV PACKAGING, STORAGE & SUPPLY			
Module	Learning objective	Hrs	Contents
1	Inspection, assembly	5	Inspection of instrument Inspect items for cleanliness, dryness and reprocess
	Maintenance of linen		Method for handling &sterilization of theatre linen
2	Principles of packaging	5	Packaging system- Select packaging materials and technique with reference to sterilisation mode Types, uses, properties & storage of packaging material Packaging techniques, steps for wrapping instruments Sealing &labelling
3	Handling, storage and maintenance of sterile stock	3	Importance of restricting access and minimise traffic in the sterile stock area to prevent contamination Cleaning of sterile area in CSSD Handling and Stocking of sterile devices ,shelf life, stock rotation
4	Transport protocols	2	Transporting medical devices to and from the CSSD Transport protocols for contaminated equipment and sterile supplies Different types of supply distribution system

2.8.2 TEXT BOOK/REFERENCES:

1. Essentials of Hospital infection control- Apurba s Sastry, Deepashree
2. Central Service technical Manual -8th edition IAHCSMM
3. The basics of Sterile Processing-6th edition by Nancy Chobin

2.9 POSTINGS

2.9.1 First Year:

- CSSD
- Operation Theatre
- ICUs,
- Dialysis Units,
- Endoscopy room
- CATH Lab

2.9.2 Second Year: Speciality posing in

- Super speciality posting (Gastro, Neuro OT, ICUs),
- New born Nurseries,
- Labour Room
- Dental college
- Ophthalmic hospital
- Visit to SCTIMST

2.10 Records/Log Book/Seminars

A logbook must be maintained which should contain the postings in various departments during the two academic year.

3. EXAMINATION

3.1 Scheme of internal assessment

Minimum of 2 internal assessment & one model exam are to be conducted. The averages of these marks are to be tabulated and presented to the DME before the final examination. Practical & Viva voce including all aspects of CSSD has to be conducted in second year.

3.2 Final examination

3.2.1 The Authority to conduct the examination:

The Director of Medical Education, Government of Kerala

3.2.2 Frequency

Regular examination shall be conducted at the end of the 1st and 2nd years.

Supplementary examination shall be conducted within 3 months of publishing regular examination result.

Candidate need to attend only the failed paper of the corresponding year

3.2.3 Eligibility

- a. Minimum of 80% attendance in theory & Posting is required to appear for the final exam.
- b. Certificate of satisfactory completion of the course by the Course Director or Head of Department/Institution.

3.2.4 Schedule of Exam

- a. Regular examination shall be conducted at the end of the academic year.
Theory examination in first year and theory, practical & Viva voce in second year.

- b. Total 8 Papers (4 papers in the 1st year and 4 papers in the 2nd year including Practical and viva voce). Since practical and viva voce is separate from a candidate fails for it, they have to attend that only.
- c. Practical and viva must be conducted in CSSD, by a qualified external examiner from microbiology dept,
- d. Practical exam can be conducted in the form of Spotters and applied Questions based on what they have studied in the 2 academic year like CSSD machines, packing materials ,surgical devices, various aspects of sterilization and quality indicators .

3.2.5 Scheme of examination

First year

<i>Paper</i>	<i>1st year</i>	<i>Theory (marks)</i>	<i>Internal Assessment marks</i>	<i>Total Marks</i>
<i>IA</i>	<i>Basic Anatomy</i>	<i>20</i>	<i>25</i>	<i>75</i>
<i>IB</i>	<i>Basic Physiology</i>	<i>20</i>		
<i>IC</i>	<i>Basic Pathology</i>	<i>10</i>		
<i>II</i>	<i>Basic Microbiology</i>	<i>50</i>	<i>25</i>	<i>75</i>
<i>III</i>	<i>Sterilization & Disinfection</i>	<i>50</i>	<i>25</i>	<i>75</i>
<i>IV</i>	<i>Engineering Aspect,</i>	<i>10</i>	<i>25</i>	<i>75</i>
	<i>Inventory Management, CSSD</i>	<i>15</i>		
	<i>administration</i>	<i>15</i>		
	<i>Computer Fundamentals</i>	<i>10</i>		
	Total			300

Second Year

<i>Paper</i>	<i>2nd year</i>	<i>Theory (marks)</i>	<i>Internal Assessment marks</i>	<i>Minimum marks for a pass</i>	<i>Total Marks</i>
<i>I</i>	<i>Processing of medical device</i>	<i>50</i>	<i>25</i>	<i>37.5</i>	<i>75</i>
<i>II</i>	<i>Health care associated infection & Infection control procedures</i>	<i>50</i>	<i>25</i>	<i>37.5</i>	<i>75</i>
<i>III</i>	<i>Quality assurance in CSSD process</i>	<i>50</i>	<i>25</i>	<i>37.5</i>	<i>75</i>
<i>IV</i>	<i>Packaging, storage & supply</i>	<i>50</i>	<i>25</i>	<i>37.5</i>	<i>75</i>
	Total			150	300
	<i>Practical & Viva</i>	<i>65</i>	<i>35</i>	<i>50</i>	<i>100</i>
	Total			200	400

D. Each paper shall be of duration of 2 hours.

3.2.5 Examiners

Faculty with post PG teaching experience of minimum of 3 years in the concerned course/subject is eligible to be an examiner/to value answer papers

Inventory Management, CSSD administration Processing of medical device Quality assurance in CSSD process Packaging, storage & supply classes and paper valuation by Nursing college faculty, Post PG with 3yrs experience.

Practical & viva examination must be done based on the CSSD related subjects of 1st and 2nd year.

Internal/External Examiner must have 3yrs post PG experience. External examiner must be a microbiologist

3.3 Promotion criteria

All students who have completed the 1st year course are eligible to be promoted to 2nd year, irrespective of result of 1st year result. Supplementary exam has to be conducted within 6 months of publishing 1st year exam result. However, certificate will be awarded at the end of the course only to those who have passed in all subjects in 1st and 2nd year.

3.4 Pass Criteria

Minimum of 45% of marks in each theory paper and internal marks together with a minimum of 50% of marks in the total theory paper and a minimum of 50 % of marks in the oral/practical exam with a minimum of 50% aggregate marks of the grand total (Total theory, practical and internal assessment) –

First year examination - 150 out of 300.

Second year examination - 200 out of 400

If a student fails in practical exam, he need to attend only the practical and viva examination.

3.5 First class/Distinction/Rank

Candidates scoring not less than 65% & above shall be awarded first class. Candidates scoring 75% & above shall be awarded distinction. Candidates who scores highest mark in the grand total (Theory, practical and internal assessment) shall be awarded the first Rank.

Any candidate who requires reevaluation shall submit the request to do so within 14 days of the official declaration of the result.

3.6 Model question paper for each subject with question paper pattern

First year

Subject	Marks
Paper I (Max.marks:50) <i>Basic Anatomy</i>	(20)
Short Essay	1x5
Short notes	5x2
Fill up/one word	5x1
<i>Basic Physiology</i>	(20)
Short Essay	1x5
Short notes	5x2
Fill up/one word	5x1
<i>Basic Pathology</i>	(10)
Short notes	5x2
Total	50
Paper II(Max.marks:50) <i>Basic Microbiology</i>	
Essay	1x10
Short answers	5x5
Short notes	5x2
Fill up/one word	5x1
Total	50
Paper III (Max.marks:50) <i>Sterilization&Disinfection</i>	
Essay	1x10
Short answers	5x5
Short notes	5x2
Fill up/One word	5x1
Total	50
Paper IV(Max.marks:50) <i>Engineering Aspect</i>	(10)
Short notes	5x2
<i>Inventory Management</i>	(15)
Short notes	5x2
Fill up/one word	5x1
<i>CSSD administration</i>	(15)
Short notes	5x2
Fill up/one word	5x1
<i>Computer Fundamentals</i>	(10)
Short notes	5x2
Total	50

Second Year

Subject	Marks
Paper I- <i>Processing of medical device</i> (Max.marks:50)	
Essay	1x10
Short answers	5x5
Short notes	5x2
Fill up/one word	5x1
Total	50
Paper II- <i>Health care associated infection & Infection control procedures</i> (Max.marks:50)	
Essay	1x10
Short answers	5x5
Short notes	5x2
Fill up/one word	5x1
Total	50
Paper III-<i>Quality assurance in CSSD process</i> (Max.marks:50)	
Essay	1x10
Short answers	5x5
Short notes	5x2
Fill up/one word	5x1
Total	50
Paper IV-<i>Packaging, storage & supply</i> (Max.marks:50)	
Essay	1x10
Short answers	5x5
Short notes	5x2
Fill up/one word	5x1
Total	50

MODEL QUESTION PAPERS

Model Question Paper

Reg. No:

First Year Diploma in Central Sterile supply Technology (DCSST) Examinations

Paper I- Anatomy, Physiology and Pathology

Time:2 ½ Hrs

Max.marks:50

Answer all questions

Draw diagram wherever necessary

Write each Section in separate answer sheet

Section A -Anatomy (20 marks)

Short Essay: (1×5 =5)

1) Stomach

Write Short Notes on: (5x2 = 10)

2) Neuron

3) Transitional epithelium

4) Lungs

5) Thyroid gland

6) Kidney

Fill up: (5x1=5)

7) Haversian canal is seen intissue

- 8) The cell shows metachromatic granules
- 9) is the largest artery in the human body
- 10) The divides into two bronchi
- 11) The carries urine from kidney to the urinary bladder

Section B -Physiology (20 marks)

Short Essay:

(1×5=5)

- 1) Define blood pressure. Write the normal value and explain the determinants of blood pressure.

Write Short Notes on:

(5×2 = 10)

- 2) Synaptic transmission
- 3) Complications of blood transfusion
- 4) Functions of gastric juice
- 5) Surfactants
- 6) Hormones of anterior pituitary

Fill up:

(5×1=5)

- 7) Visual receptors are.....and.....
- 8) Normal platelet count is.....
- 9)is pacemaker of heart
- 10)is the functional unit of kidney
- 11) Two hormones of pancreas are.....and

Section C -Pathology (10 marks)

Write Short Notes on:

(5×2 = 10)

1. What are the cardinal signs of inflammation?
2. Briefly mention the differences between benign and malignant tumours
3. Classification of shock
4. Draw a neat labelled diagram of a granuloma.
5. Mention the names of the chemical tests done on urine

Model Question Paper

Reg. No:

First Year Diploma in Central Sterile supply Technology (DCSSD) Examinations

Time:2 ½ Hrs
Max.marks:50

Paper II- Basic Microbiology

Answer all questions

Draw diagram wherever necessary

Essay:

(2+2+3+3=10marks)

1)Describe the structure, modes of transmission and laboratory diagnosis of Human immunodeficiency virus.How will you manage needle stick injury?

Short answer questions:

(5x5=25)

- 2) Bacterial growth curve
- 3) Coliform count
- 4) Atypical mycobacteria
- 5) Normal flora
- 6) What is biofilm? Significance of biofilm formation.

Write Short Notes on:

(5x2 = 10)

- 7) Bacterial toxins
- 8) Active immunity
- 9) MRSA
- 10) Prophylaxis of hepatitis B
- 11) What is opportunistic mycosis/ Name 4 fungi causing it

Fill up(5x1=5)

- 12).....is the definitive host of malaria
- 13)Selective media for diphtheria is.....
- 14)Capsule is demonstrated by.....staining
- 15).....is ayeast like fungi
- 16) Routine culture media for fungus is.....

Model Question Paper

Reg. No:

First Year Diploma in Central Sterile supply Technology (DCSST) Examinations

Time: 2 ½ Hrs
Max. marks: 50

Paper III- Sterilization & Disinfection

Answer all questions

Draw diagram wherever necessary

Essay:

(1+2+3+2+2=10))

1) What is sterilization? Classify sterilization methods. Describe different types of autoclave, Write the principle and working of autoclave

Short answer questions:

(5x5=25)

2) Sterilization controls

3) Gaseous sterilization

4) Spaulding's classification

5) How will you reprocess prion contaminated surgical devices?

6) Chemical Sterilant

Write Short Notes on:

(5x2= 10)

7) Cold sterilization

8) Flash sterilization

9) Theatre sampling

10) Advantage and disadvantages of ETO sterilizer

11) Testing of disinfectants

Fill up

(5x1=5)

11).....is the commonly used disinfectant for surface cleaning

12) The most commonly used sporicidal disinfectant is.....

13) Biological indicator in sterrad uses spores of.....

14) Aeration is required inmethod of sterilization

15) Thermometer is disinfected by using.....

Reg. No:

First Year Diploma in Central Sterile supply Department (DCSST) Examinations

Time: 2 ½ Hrs

Max.marks:50

Answer all questions

Draw diagram wherever necessary

Write each Section in separate answer sheet

Section A-Engineering aspects (10 marks)

I. Write Short Notes on:

(5x2 = 10)

1. What are the onsite pre-requisites for the installation of a steam steriliser?
2. What is Vacuum and unit of Vacuum in SI system?
3. What are the basic control parameters of Steam Autoclave?
4. What are to be ensured before putting ETO Steriliser in operation?
5. What is non-ionising Radiation and microbicidal range used for sterilising?

Section B- Inventory Management(15marks)

I. Write Short Notes on:

(5x2 = 10)

1. Write a brief note on functions of inventory
2. Draw the diagram of inventory cycle
3. Define inventory
4. Briefly explain the importance of accurate records
5. write a brief note on PAR

Fill up:

(5x1=5)

6.is an inventory replenishment method that involves the exchange of a freshly filled supply cart on a use unit
7. In the health care facility high cost, reusable inventory items are called
8. involves moving of supplies throughout the facility, generally from storage location to the point of use.
9. Emergency supply orders requiring immediate action is orders.
10. cart system enhance infection prevention practices.

Section C- CSSD Administration (15marks)

Write Short Notes on:

(5x2 = 10)

1. What are the qualities of a first aider
2. List down the basic knowledge and skill required for a CSSD technician
3. Draw the diagram of CSSD work flow
- 4 Brief note on PPE
5. Why monitoring of decontamination area of CSSD is very important

Fill up:

(5x1=5)

6. _____ is the reduction or removal of infectious or harmful substances from an object, area or person.
7. _____ is a cart prepared for an individual procedure.
8. Department which is responsible for researching, ordering, receiving and managing inventory is _____
9. _____ is using appropriate barriers to reduce the risk of blood borne and other pathogens.
10. Contaminated means _____

Section D- Computer Fundamentals (10marks)

Write Short Notes on:

(5x2= 10)

1. What is a computer?
2. Input and Output devices of computer
3. Basic operations in office software
4. Explain Hardware
5. Explain software



GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
CENTRAL STERILE SERVICE TECHNOLOGY (DCSST) COURSE REGULAR EXAMINATION APRIL 2022
DCSST-S-I-APRIL-2022

(Draw diagrams wherever necessary)

PROCESSING OF MEDICAL DEVICES

- I. Essay (2+4+4=10)
Define cleaning? Explain types of cleaning tools? Write in detail about different mechanical cleaners?
- II. Write Answers (5x5=25)
1. Steps in process of decontamination
 2. Explain the point of use preparation procedures
 3. Explain personal protective equipment (PPE)
 4. What are the tips to protect instruments from damage
 5. Write any five types of surgical devices with equipment.
- III. Short Notes (5x2=10)
1. Biofilm
 2. Decontamination
 3. Biohazard signage
 4. Automated cart washers
 5. Loaner instrument
- IV. Fill up (5x1=5)
1. Expand TASS
 2. is the substances that lowers the surface tension of water and increases the solubility of organic compound.
 3. Cutting instruments such as knives, blades, scalpels are called
 4. is an instrument used to examine the interior of hollow organs.



GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
CENTRAL STERILE SERVICE TECHNOLOGY (DCSST) COURSE REGULAR EXAMINATION APRIL 2022
DCSST-S-II-APRIL 2022

(draw diagrams wherever necessary)

HEALTH CARE ASSOCIATED INFECTION & INFECTION CONTROL PROCEDURES

- I. Essay: (2+3+5=10)
1. Definition of Hospital acquired infection. What are the types of HAI? How you can prevent hospital acquired infections
- II. Short answers (5x5=25)
1. Biomedical waste management
 2. Role of CSSD in infection control
 3. How will you manage needle stick injury
 4. Hand hygiene
 5. Outbreak investigation
- III. Write Short notes on : (5x2=10)
1. Doffing
 2. Epidemiological triad of HAI
 3. Droplet precaution
 4. MRSA
 5. HEPA filter
- IV. One word questions (5x1=5)
1. Time required for Hand hygiene using alcohol based hand rub is
 2. Sharps and needles are disposed in.....
 3. N95 mask used as part of type of transmission
 4. High level disinfectant used for endoscopes is.....
 5. Ideal time to start post exposure prophylaxis of HIV is within hrs



GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
CENTRAL STERILE SERVICE TECHNOLOGY (DCSST) COURSE REGULAR EXAMINATION
APRIL 2022

DCSST-S-III-APRIL 2022

Time 2 hrs

Part II paper III

Max :50 Marks

(draw diagrams wherever necessary)

QUALITY ASSURANCE IN CSSD PROCESS

- I. Essay (1+2+3+4=10)
What is quality? Define elements of quality assurance? Explain the methods of sterilization control with example?
- II. Short answer questions: (5x5=25)
1. Importance of documentation in quality control
 2. Role of CS technician in quality assurance in CSSD
 3. Explain the quality of care
 4. Explain the quality assurance program.
 5. Explain the sterilizer qualification testing
- III. Write Short notes on : (5x2=10)
1. Cleaning verifications
 2. Quality assurance
 3. Six sigma
 4. Root cause analysis
 5. Sentinel events
- IV. Fill Up (5x1=5)
1. OSHA is
 2. Probability of viable microorganism present on product even after sterilization is
 3. is a quality process that focuses on eliminating waste in the production of products.
 4. Expand TQM
 5. Expand ISO



GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
CENTRAL STERILE SERVICE TECHNOLOGY (DCSST) COURSE REGULAR EXAMINATION
APRIL 2022

DCSST-S-IV-APRIL 2022

Time 2 hrs

Part II paper 1V

Max :50 Marks

(draw diagrams wherever necessary)

PACKAGING, STORAGE & SUPPLY

- I. ESSAY (2+4+4=10)

Define assembly area? What are the requirements of assembly and packaging area?
Explain the role of CS technician in maintaining the standards in assembly and packaging.

II. Short Answers

(5x5=25)

1. Principles of packaging
2. Explain disposable packaging materials
3. Methods of handling OT linens
4. Explain importance of labeling
5. What are the guidelines for preparation of pack content?

III. Short Notes

(5x2=10)

1. Wicking material
2. Process challenge devices
3. Muslin
4. Rigid container system
5. Wet pack

IV. Fill Up

(5x1=5)

1. Packages is considered sterile until a specific expiration date is called
2. is applied over the packages after sterilization to protect from damage.
3. One example of chemical indicator is
4. Expand FAN principle
5. Temperature of the assembly area should be maintained between

.....

Syllabus of Diploma Courses

Conducted by Directorate of Medical Education.

Medical College PO, Thiruvananthapuram



POST GRDUATE DIPLOMA IN CLINICAL CHILD DEVELOPMENT

Course Code:

1. COURSE CONTENT

1		
1.1	Title of the course	PGDCCD (POST GRADUATE DIPLOMA IN clinical child development)
1.2	Aim of the course	To develop human resources in the area of developmental therapy to facilitate appropriate physical and functional therapeutic intervention, so as to achieve maximum functional independence and better quality of life for persons with disabilities.
1.3	Objective of the Course	To develop an overview on all aspects of human growth and development through life-span approach. To develop an in-depth knowledge of human anatomy and physiology. To develop skills for conducting physical and functional assessments, within a interdisciplinary approach. To provide physical and functional therapeutic skills in developing effective and holistic intervention strategies using a life-span approach
1.4	Medium of instruction	ENGLISH
1.5	Duration	2 years
1.6	Academic eligibility	As per Academic Regulation of the course and Prospectus for admission approved by the Government from time to time
		Indian citizen of Kerala origin is eligible for admission.
		The Candidate should be above the age of 20 years.
1.7	Strength/batch	12/batch
1.8	Reservation	As per existing Government guidelines
1.9	Admission requirement	Selection to the course shall be made by the Director of Medical Education. Selection will be made on merit basis and based on the marks obtained in the qualifying examination.
1.10	Subjects of study	
1.10.1	First Year (PART-1)	
	Paper-1	Human biology, Social and behavioral sciences, Community

		health and biostatistics
		Guidance and Counseling
	Paper-2	Nutrition, Growth and development of children and adolescents-, women & child development
1.10.2	Second year (PART-II)	
	Paper-1	Maternal health, Normal and at risk newborns, Neonatal follow p program
	Paper-2	Early child care and education (ECCE), physical therapy, Montessori, Preschool for children needing special care
	Paper-3	Project

2. DISTRIBUTION OF HOURS

PART-I

	2.1 Part-1: Paper-1		2.2 Part-1: Paper-II		2.3 Part-1:Paper-III	
A	Section A	Hrs	Section A	Hrs		
1	Unit 1	2	Unit 1	1		
2	Unit 2	5	Unit 2	4		
3	Unit 3	5	Unit 3	1		
4	Unit 4	2	Unit 4	1		
5	Unit 5	2	Unit 5	1		
6	Unit 6	2	Unit 6	1		
7	Unit 7	2	Unit 7	2		
8	Unit 8	2	Unit 8	2		
9	Unit 9	2	Unit 9	1	Clinical posting hours	300
10	Unit 10	7	Unit 10	2		
11	Unit 11	5	Unit 11	3		
12	Unit 12	5	Unit 12	2		
13	Unit 13	5	Unit 13	2		
14	Unit 14	2	Unit 14	10		
			Unit 15	10		
			Unit 16	10		
			Unit 17	5		
			Unit 18	5		
	TOTAL					
	TOTAL					
	GRAND TOTAL					

Part II

	2.4 Part-II: Paper-1		2.5 Part-II: Paper-II		2.6 Part-II: Paper-III	
A	Section A	Hrs	Section A	Hrs	Section A	Hrs
4	Unit 4		Unit 4	20		
5	Unit 5		Unit 5			
6	Unit 6		Unit 6			
7	Unit 7		Unit 7			
8	Unit 8		Unit 8			
9	Unit 9		Unit 9			
10	Unit 10		Unit 10			
11	Unit 11		Unit 11			
12	Unit 12		Unit 12			
13	Unit 13		Unit 13			
14	Unit 14		Unit 14			
15	Unit 15		Unit 15			
	TOTAL					
	GRAND TOTAL					

3. DETAILED SYLLABUS

- 3.1 **PART I – PAPER I** Human biology, Social and behavioral sciences, Community health and biostatistics, Guidance and Counseling

Human biology

Unit 1 :Brain Development : Structure of brain, neuron, neurotransmitters , ventricles, blood supply, Craniosynostosis, Microcephaly, Muscular Dystrophy, Neural tube defects ,Anencephaly, Encephalocele, Spina bifida

Unit 2: Skeletal system- classification and function- types

Unit 3: Endocrine glands- introduction- thyroid gland, pituitary gland.

Unit 4: **Eye & Vision** : Sight and the eye structure & functions, physiology of sight, visual pathway, cataract, squint, retinopathy of prematurity, retinal detachment, keratomalacia, visual abnormalities astigmatism, myopia, presbyopia, blindness, management. Anophthalmia / Microphthalmia.

Unit 5: Speech & Language Development : speech production, human speech apparatus, pre requisites for speech, Cleft Lip / Cleft Palate, Congenital deafness

Unit 6: Ear & Hearing : Structure & Function, auditory pathway, physiology of hearing & balance, cochlear implant.

Unit 7: Genetics: Genes, chromosomes, chromosomal abnormalities Down syndrome, Klinefelter's syndrome, Turner's syndrome, Fragile X syndrome, other developmental syndromes, Genetic counseling

Unit 8: Other systems: Congenital Heart Defects, Atrial Septal Defect, Atrioventricular Septal Defect, Ventricular Septal Defect, Diaphragmatic Hernia, Esophageal Atresia, Hypospadias, Upper and Lower Limb Reduction Defects, Club foot

Social and behavioral sciences

Unit 1 Introduction; developmental theories- psychodynamic theory, cognitive development theory, learning theory.

Unit 2 Introduction to general psychology- psychological illnesses- personality, mental hygiene,

Unit 3 Developmental periods- Prenatal Period- Infancy -Babyhood Early childhood- Late Childhood- Puberty & Adolescence

Guidance and Counselling

Unit 1 **Principles & Practice of Guidance** :Understand guidance, Guidance and other related fields. Types of guidance **Educational & Career Guidance**

Unit 2 **Life skill Development:** principles and need for skill training, empowerment through life skill training, life skill education programme,

Unit 3 **Principles and process of Counselling:** Types of counseling, process, characteristics of counselor, counselor –counsee relationship, Approaches in counseling

Unit 4 **Behavioural problems in children** : Understanding children and their needs. Developmental disorders, behavioural problems in children in various age groups- play needs of children- play therapy-juvenile delinquency

Unit 5 **Behaviour modification** : Basic concepts, principles of learning, theories of learning, different techniques in behavioural modification and therapy. **Cognitive behavior therapy, Applied Behaviour Analysis**

Unit 6 **Parenting the Toddler & preschooler& adolescents:** Types of parenting, behavioural problems in children. Emotional disorders- conduct disorders, habit disorders, psychosomatic problems, adjustment problems of children, management

Community health and biostatistics

Unit 1 Health definition, levels of prevention, definition of rehabilitation, impairment, disability, handicap, difference between disability and handicap- Role of Social worker, Social aspects of rehabilitation

- Unit 2** **Health Education:**Introduction , aim, objectives, principles and techniques of health education, audiovisual aids
- Unit 3** **Health programme/Agencies involved in early childcare:** International agencies, National, Integrated Child Development Scheme (ICDS)- NRHM,RBSK,IMNCI **Health Prorgammes in India:** Introduction Health system, levels of health care, health for all, national health policy, Major health planning in India. universal immunization,.
- Unit 4** **Community based Rehabilitation (CBR) :** Scope of CBR: members of CBR team, implementation
- Unit 5** **Muscular deformity:** Muscular dystrophy- Gradual progressive muscle loss, club feet, flat feet, bow legs and knock knee (Neuro)
- Unit 6** **Activities of Daily Living (ADL):** ADL assessment, Grading, training, Feeding, dressing, toilet training, bathing, ways to improve learning and behavior
- Unit 7** **Aids :** Parallel hair, walking frame, rollators, walking sticks, crutches, wheel chair, Low vision aids, hearing aids
- Unit 8** **PWD act-** revised, POCSO act-
- Health Science Research**
- Unit 1** **Descriptive statistics:** Introduction, measures of central tendency- mean, median, mode, measures of dispersion, range, quartile deviation, mean deviation, standard deviation, odds ratio
- Unit 2** **Research Design;** protocol, hypothesis, methodology, pilot study, deciding design, methods of data collection, choosing samples, pretest, data collection, processing data, report writing. -
- Unit 3** **Types of study Cohort study,** types of cohort study, case control study, clinical trials, diagnostic test evaluation
- Unit 4** **Interpretation :** Meaning of interpretation, technique of interpretation, precautions in interpretation, data presentation and report writing- classification, tabulation, interpretation, diagrammatic and graphic presentation. Report writing- review literature, problem, objectives, methodology and use of foot notes – bibliography.
- Unit 6** **Computer applications in research :** introduction to data entry, data cleaning, Microsoft Excel, Access, statistical packages

3.2 PART I-PAPER II Nutrition, Growth and development of children and adolescents-, women & child development

Nutrition

- Unit 1 Classification of food- composition-function-requirements- sources- carbohydrate, fats proteins, minerals, iron, vitamins, water trace elements.
- Unit 2 Energy requirements in various age group- pregnant and lactating mothers, balanced diet.
- Unit 3 Adolescent Nutrition :requirements- importance- policies-programmes
- Unit 4 Weaning- preparation and storage of food
- Unit 5 Malnutrition-kwashiorkor-marasmus- vitamin deficiencies
- Unit 6 National programmes.in nutrition -supplementary feeding programmes - Mid day meal programme- vita A prophylaxis
- Unit 7 Nutrition & Life Style Diseases: Adolescent nutrition, Nutritional requirements, recommended diet, Nutritional problems, Eating Disorders, Introduction, Common life style diseases, preventive strategies, complications, life style modification.
- Unit 8: Vitamin A deficiency, Vitamin D deficiency, Calcium deficiency, Iron deficiency Hormone deficiency

Growth and development of children and adolescents-

(Normal & abnormal)

- Unit 1 Growth and development of neonates and infants
- Unit 2 Growth and development of preschool and school age- Introduction, characteristics, Piaget's cognitive development, psycho-social development, Erickson's identity development, Kohl berg's Moral development.
- Unit 3 Growth and development of adolescents-Introduction, characteristics, Adolescent Growth determinants, physical growth, puberty, development of secondary sexual characteristics, Tanner rating scale, hormonal changes – physical, psychological & social consequences, Barker hypothesis. **Adolescent Mental Health:** Introduction, mental status examination, emotional, mood, conduct disorders, psychosomatic disorders, depression, management suicide prevention, crisis intervention. **Adolescent Substance Abuse** health hazards of smoking, passive smoking, prevention, alcohol- addiction, de-addiction programs, drugs commonly used drugs, symptoms and risk factors of drug abuse, prevention

- Unit 3:** Development of special senses: communication development, speech & language development, speech & language milestones, resonance, nasality, voice, fluency, articulation – normal & abnormal. Visual development

Environment and child development

- Unit 1** ICDS- components
- Unit 2** Home environment a child development : Types of home environment- influence on child development-Home Screening Questionnaire (HSQ), Home Observation for the measurement of Environment (HOME), Influence of heredity and environment, role of mother.
- Unit 3** First Aid: First aid principles, qualities, first aid in poisoning, road traffic accident, bleeding, snakebite and bandaging

Maternal health

- Unit 1** **Embryology** : Introduction, gametogenesis- spermatogenesis, oogenesis, fertilization & implantation, maturation ovum, cellular formation and differentiation- ectoderm- mesoderm-endoderm, formation of placenta, growth and development of foetus
- Unit 2** **Reproductive Health** :Male and female reproductive system, nocturnal emission, physiology of menstruation, common menstrual problems, management, dysfunctional uterine bleeding, amenorrhoea- primary and secondary, poly cystic ovarian syndrome, urinary tract infection. Family Life Education (FLE)
- Unit 3** **Prenatal diagnosis:** Low Birth Weight/IUGR, Microcephaly, Congenital Cataract, Neonatal seizures, chromosomal abnormalities- Downs syndrome, hypothyroidism, metabolic disorders and intra uterine infections
- Unit 4** **Diagnostic Techniques:**Maternal serum screening for birth defects. Aminocentesis, Cordocentesis, Chronic villus sampling, foetal blood sampling, thyroid function tests, urine aminogram, TORCH screening- teratogenic drugs and fetal outcome
- Unit 5** **Normal Pregnancy** : Antenatal care – 1st trimester, 2nd trimester, 3rd trimester, introduction to antenatal diagnosis- ultrasound scan, antenatal assessment of foetal well- being – contraception
- Unit 6** **Abnormal Pregnancy:** Vomiting, high risk pregnancy,– abortions-MTP, ectopic pregnancy, multiple pregnancy, Polyhydramnios, Antepartum hemorrhage – placenta previa- abruptio placenta, assistive technologies
- Unit 7** **Intra Uterine Growth & Growth Restriction** – Introduction, incidence, types-symmetrical assymetrical, etiology, diagnosis, complications, management
- Unit 8** **Intra Uterine Infections:** Viral infections in pregnancy measles, influenza, chicken pox, CMV, mumps, TORCH, HIV, Screening common diseases of pregnancy.

Early Detection for Developmental Delay

- Unit 1** **Assessment of physical growth:** Anthropometric measurements – weight, length/height, head circumference, upper segment- lower segment ratio, techniques of measurement, instruments used for measurement, growth chart, growth velocity, normal values appropriate for the age.
- Unit 2** **Development of Teeth:** eruption of primary teeth, permanent teeth, exfoliation of primary teeth, abnormalities in development of teeth, dental caries, dental health.
- Unit 3** **Early Stimulation Programme (0-6 months):** Infant stimulation programme in NICU, Early stimulation- Low Birth Weight and pre-term babies, Infant massage techniques, tactile stimulation
- Unit 4** **Developmental assessment :**Developmental assessment- introduction, need and importance, screening test, diagnostic test, CDC model of early detection, Developmental Observation Card (DOC), Trivandrum Developmental Screening Chart (TDSC), CDC Grading for motor milestones (head control, sitting, standing), TABC, M-CHAT, NEST, LEST
- Unit 5** Introduction, simple clues to detect hearing and vision abnormalities, reflex responses, strabismus, Picture vision test, Snellen's letter chart, Other techniques of hearing & vision assessment

3.4 PART II- PAPER I maternal health, Normal and at risk newborns, Neonatal follow up program

Normal and at risk newborn

- Unit 1** **Natal care & Postnatal Care:** Types of delivery- normal labour, stages, Spontaneous delivery, caesarian Section, Instrumental delivery vacuum forceps, postpartum haemorrhage, postnatal care, post natal exercise
- Unit 2** **Common diseases** **Hypoglycemia** – Etiology, significance and sequelae, neurological damage and outcome, clinical manifestation and classification **Hyperbilirubinemia** : Kernicterus, ABO, Rh incompatibility jaundice, neurological damage and outcome, resuscitation, outcome, management **Hypoxic Ischemic Encephalopathy**- Introduction, Birth asphyxia, mild, moderate, severe, APGAR score, Neurological damage and outcome, resuscitation, outcome, prognosis, foetal hypoxia **Intraventricular hemorrhage**- leukomalacia etiology, clinical manifestation, subarachnoid, intracranial signs, neurological damage and outcome **Septicemia** &

Meningitis- Bacteremia, Pathogenesis, clinical manifestation, treatment, prevention, neurological outcome and damage. **Meningitis, Etiology, Epidemiology, clinical manifestation, diagnosis and treatment** **ROP, Pathogenesis, classification, clinical course and prognosis, diagnosis, treatment, prevention, neurological damage and outcome.** **Neonatal Convulsion-** clinical profile, Etiology, Management maintenance therapy, neurological damage and outcome, **Neural tube defects-** spina bifida occulta, **Meningococlemyclomeningocoele,** etiology, prenatal diagnosis, clinical features treatment. Management, encephalococcal, anencephaly, neurological damage and outcome- **neonatal hypothyroidism**

- Unit 3** Newer vaccines & immunization, worm infestation, environmental hygiene., weaning – preparation of weaning food, artificial feeding, food pyramid, nutritional requirements, nutritional deficiency
- Unit 4** Common Childhood Illness: Acute Diarrheal disease, acute respiratory infections. fever, asthma, febrile convulsion, skin problems, vaccine, preventable diseases, integrated management of neonatal, childhood illnesses
- Unit 5** Reflex development: New born reflexes – primitive reflexes, persistence of reflexes, development of motor skills
- Unit 6** Normal and abnormal birth marks, haemangioma, breast engorgement- fontanellae- otitis media- umbilical sepsis-umbilical hernia- neonatal conjunctivitis
- Unit 7** Breast feeding & lactation counselling–

Neonatal follow up programme and early detection & intervention

- Unit 1** **Long term outcome of NICU graduates:** General outcome, mental development, motor development, hearing and vision problem neurological damage and outcome, childhood onset adult diseases- risk stratification- NNF
- Unit 2** **Development Quotient (DQ):** Introduction, assessment, Developmental Assessment Scale for Indian Infants (DASII)- BSID- administration & interpretation, mental scale- motor scale, raw score, mental age, motor age
- Unit 3** **Intelligence Assessment :** IQ, classification, intelligence tests- Weschler intelligence scale for children-R (WISC- R), Mallin's Intelligence Scale for Children (MISC), Seguin form board, colored progressive matrices, standard progressive matrices. – Binet Kamat.
- Unit 4** **Developmental Assessment:** School readiness assessment – Nursery Evaluation Scale Trivandrum (NEST) Junior & Senior, Denver Developmental Screening Chart (DDST), Draw-A-Man Test, Vineland Socio maturity Scale (VSMS), Childhood Autism Rating Scale (CARS), Receptive Expressive Emergent Language Scale (REELS)- CBCL-VABS- CSBS_DP
- Unit 5** **Speech & language disorders- Communication Disorders :** Etiology, normal & abnormal speech, delayed & deviant speech, speech disorders- aphasia, apraxia, dyslexia, articulation disorders- fluency disorderws-, sluttering, cluttering, cleft palate, cleft lip, voice disorders. -communication problems in children with ASD, ADHD

Unit 6 **Audiology :** Speech acoustics, hearing disorders- types, causes, degrees of hearing loss informal & formal audiometry, pure tone audiometry, BERA, Otto Acoustic Emission, Impedance Audiometry, Play audiometric audiograms.- cochlear implantation.BOA

Early Intervention for Developmental Delay

Unit 1 **Early Intervention:** Introduction, need, importance, , developmental delay- causes, portage, programme for early stimulation and education.

Unit 3 **Early Interventional Therapy:** Early therapy- CDC model (based on TDSC, CDC grading), home based early intervention, mother –the therapist.

Unit 4 **Early Intervention for hearing and vision:** Vision and hearing stimulation in early infancy, signs & symptoms suggestive of hearing & vision abnormalities, stimulation techniques for hearing & vision impairment.

Unit 5 **Play and play therapy:** Importance of play, type of play age appropriate toys, selection of toys, play therapy- techniques, music therapy.

Unit 6 **ELI &Speech Therapy:** Speech & Language Assessment, tools for assessment, speech stimulation, speech therapy

Unit 7 **NDT Evaluation:** muscle power, Ashworth grading- muscle tone- hypertonia and hypotonia, against and antagonistic muscle, oral motor problems and management and postural reactions, Range of motion, Postural alignment.

Unit 8 **Organization of a neonatal follow up program:** Introduction, present status, need, at-risk baby clinic, high risk baby clinic, development friendly well baby clinic, preschool clinic, organization of neonatal follow up.

Early child care and education

Unit 1 Cognitive development

Unit 2 Jean piaget theory for education

Unit 3 Early academics pros and cons

Unit 4 Readiness for kinder garten

Unit 5 Reading and writing readiness

Unit 6 Role of teacher in child development and education

Physical therapy

Unit 1 **Cerebral Palsy Introduction :**Classification, etiology, associated problems

Unit 2 **Exercise instructions for parents:** Exercise instructions for parents: Exercises different kinds range of motion, stretching, strengthening, exercises with and without motion, to improve positions, to improve control, ideas for making exercises fun

Unit 3	Early play activities and toys: Toys and play things to stimulate senses, toys for touching, toys to taste, toys to smell, toys for seeing, toys for balance, toys for hearing, toys to develop mind and eye hand coordination, low cost toy making
Unit 4	Developmental aids: Lying aids, sitting aids, standing and walking aids, aids for balancing and body control, other aids, crutches, aids for reading, writing and drawing
Unit 5	Postural alignment, gait – common gait abnormalities in cerebral palsy
Unit 6	Treatment Approaches: Muscle education and braces, progressive pattern movement, synergistic movement patterns, proprioceptive neuromuscular facilitation, neurodevelopmental treatment with reflex inhibition and facilitation
Unit 7	Organization of treatment, general treatment principles
Unit 8	Assessment of therapy- functional assessment, grading, examination of deformity
Unit 9	Treatment procedures: Goals, specific treatment procedures for major milestones, treatment of abnormal tone, handling
Unit 10	Prevention: prenatal, natal, post natal level, preventing secondary disabilities Persons With Disability (PWD) Act- Resised
Unit 11	sensory integration therapy

3.5 PART II – PAPER II Early childcare and education , Physical therapy, montessory, preschool for children needing special care.

Disability Spectrum & Special Education

Unit 1	Introduction to Disability Basic concepts of disability, different categories, , needs of children with disability, psychological needs, psychological needs
Unit 2	Mental Retardation: Introduction, etiology, classification, associated handicap, management, prevention, special education for mentally retarded definition, characteristics, classroom, management, curriculum, special educational assessment, evaluation, cognitive delay.
Unit 3	Hearing Impaired : Introduction, etiology, classification, associated handicap, management, prevention, special education for Hearing impaired definition, need, importance, characteristics, classroom, management, curriculum- types, special educational assessment, evaluation
Unit 4	Visually Impaired. : Introduction, etiology, classification, associated handicap, management, prevention, special education for Deaf Blind definition, need, importance, characteristics, management- types, special educational assessment, evaluation
Unit 5	Deaf Blind : Introduction, etiology, classification, associated handicap, management, prevention, special education for Deaf Blind definition, need, importance, characteristics, management- types, special educational assessment, evaluation

Unit 6	Autism spectrum Disorder: Introduction, Etiology, prevalence, classification- Autism, Aspergers Syndrome, Retts disorder, degenerative disorder, PDD- NOS, , early identification intervention modes. Characteristics assessment tools, intervention, Management
Unit 7	Attention Deficit Hyperactive Disorder: Introduction, Prevalence, classification, Characteristics assessment tools, cause, intervention, Management
Unit 8	Learning Disability: Introduction, Prevention, Etiology, classification, characteristics, assessment, early identification, diagnosis tools, causes, intervention, management
Unit 9	Multiple Disability: Introduction, prevalence, etiology, classification, characteristics, assessment tools, early identification, diagnosis, early intervention, management

Children needing special care

Unit 1	children needing special care
Unit 2	Changing concepts in special education- Inclusive education
Unit 3	Maria Montessori and preschool education-

3.6 PART II – PAPER III (Name)

Project

4. SCHEME OF TEACHING AND CLINICAL TRAINING

First Year :

Second Year:

Year	Subject	No of Hrs
First Yr	PART-I	110 hours
	Theory	
	a.	
	b.	
	c.	
	Practical & Posting	300hours
	a.	
	b.	
	c.	
	TOTAL HRS	
Second Yr	PART-II	120 hours
	Theory	

	a.	
	b.	
	c.	
	Practical & Posting	200 hours
	a.	
	b.	
	c.	
	Project work	6 months
	GRAND TOTAL	

1.1	Records	-	2
1.2	Log Book	-	1
1.3	Health Education	-	2

5 **TEACHING /LEARNING AIDS**

5.1 Books / reference books prescribed

1. Growth & Development, Elizabeth Hurlock
2. Anatomy & Physiology, Rose & Wilson
3. General Psychology, Mangal
4. Normal Child Development, Illingworth

1.2 Models/Charts:

TDSC (Trivandrum Developmental Screening Chart)
 LEST (Language Evaluation Scale Trivandrum)
 CDC grading
 Amiel Tison angles
 NEST (Nursery Evaluation Scale Trivandrum)
 TABC (Trivandrum Autism Behavior Checklist)
 Concern 9
 DDST (Denver Developmental Screening Test)
 NDST (Neuro Developmental Screening Test)
 VSMS (Vineland Social Maturity Scale)
 INDT -ADHD
 INDT - ASD
 Vanderbilt Screening Tool
 Conner's Rating Scale
 DASII (Developmental assessment Scales for Indian Infants)
 Bayley Scales of Infant Development
 REELS (Receptive Expressive Emergent Language Scale)
 CARS (Childhood Autism Rating Scale)

6 EXAMINATION

6.1 Scheme of internal assessment

Regular internal assessment through written & practical exam shall be conducted. Minimum of 3 internal assessment & one model exam are to be conducted & averages of these marks are to be tabulated and presented to the DME before the final examination.

6.2 Final examination

6.2.1 The Authority to conduct the examination:

The Director of Medical Education, Government of Kerala

6.2.2 Frequency

Regular examination shall be conducted at the end of the 1st and 2nd years.

Supplementary examination shall be conducted 6 months after the regular examination.

6.2.3 Eligibility

- a. Minimum of 80% attendance in theory & practical is required to appear for the final exam.
- b. Certificate of satisfactory completion of the course by the Course Director or Head of Department/Institution.

6.2.4]Schedule of Exam

- a. Regular examination shall be conducted at the end of the academic year which includes theory, practical & Viva voce
- b. Total 4 Papers (2 papers in the 1st year and 2 papers in the 2nd year)
- c. Each paper shall be of duration of 3 hours with total marks of 100 each. Each paper shall have 2 sections- Section A & Section B.
- d. At the end of the 2nd year both practical examinations, project & viva voce will be conducted (100 marks each)

6.3 Examiners

Faculty with post PG teaching experience of minimum of 3 years in the concerned course/subject is eligible to be an examiner

6.4 Pass Criteria

Minimum of 45% of marks in each theory paper with a minimum of 50% of marks in the total theory paper and a minimum of 40% of marks in the oral/practical exam with a minimum of 50% aggregate marks of the grand total (Total theory, practical and internal assessment) –

First year examination	-	100 out of 200
Second year examination	-	200 out of 400

First Year Examination

Total Marks- 300 :-

- Theory Paper I written Exam-----100
- Theory Paper II written Exam-----100
- Practical Examination-----100
 - a. Long case-----20
 - History Taking and Presentation*---5
 - Developmental Assessment*-----5
 - Management*-----10
 - b. OSCE (Objective Structured Clinical Examination)-----10
(5 objects- 2 Marks each)
 - c. Seminar-----20
 - Style of Presentation*-----5
 - Slide Arrangement*-----5
 - Matter*-----10
 - d. Log Book-----20
 - e. Internal-----30(20+10)
(Exam and overall assessment)

Second Year Examination

Total Marks- 400 :-

- Theory Paper I written Exam-----100
- Theory Paper II written Exam-----100
- Practical Examination-----100
 - a. Long case-----20
 - History Taking and Presentation*---5
 - Developmental Assessment*-----5
 - Management*-----10
 - b. OSCE (Objective Structured Clinical Examination)-----10
(5 objects- 2 Marks each)
 - c. Seminar-----20
 - Style Presentation*-----5
 - Slide Arrangement*-----5
 - Matter*-----10
 - d. Log Book-----20
 - e. Internal-----30(20+10)
(Exam and overall assessment)
- Viva and Project work-----100

Total Marks for the first year -----300 Marks

Total Marks for the second year -----400 Marks

Grand Total Marks-----700

6.5 General Conditions regarding Examination

A Minimum 50% marks separately for theory (Paper I and II together) and practical including project viva is required for a pass in the examination and 70% marks separately for theory (Paper I & II together) and Practical including project viva is required for a pass in the examination in first class and 80% marks separately for theory (Paper I & II together) and practical including project viva is required for a pass in examination in first class with distinction.


6.6 First class/Distinction/Rank

Candidates scoring not less than 65% & above shall be awarded first class. Candidates scoring 75% & above shall be awarded distinction. Candidates who scores highest mark in the grand total (Theory, practical and internal assessment) shall be awarded the first Rank.

Any candidate who requires revaluation shall submit the request to do so within 14 days of the official declaration of the result.

6.7 Model Mark Sheet

7. MODEL QUESTION PAPERS

 GOVERNMENT OF KERALA DIRECTORATE OF MEDICAL EDUCATION 1 YEAR PGDCCD SUPPLEMENTARY EXAMINATION DECEMBER, 2020	
Time : 3 hrs.	PGDCCD- F - II - DEC-2020 Max marks 100
PART I PAPER-II NUTRITION, GROWTH AND DEVELOPMENT OF CHILDREN AND ADOLESCENTS, WOMEN AND CHILD DEVELOPMENT (Answer All Questions)	
Section A	
	(15×2=30)
I. Define preterm birth. What are the immediate and long term complications? How will you manage a preterm baby.	
II. Explain Piaget's theory of development	
III. Write Short Notes on	(5×4=20)
1. Balanced diet	
2. Essential amino acids	
3. Mid day school meal programme	
4. Drug abuse.	
Section B	
	(15×2=30)
IV. Name the fat soluble vitamins. Explain Vitamin D in detail	
V. Discuss the growth and development of a pre-school child	
VI. Write Short notes on	(5×4=20)
1. DPT vaccine	
2. Growth charts	
3. Water borne diseases	
4. Management of cholera in a 2 year old child	



GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
1 YEAR PGDCCD SUPPLEMENTARY EXAMINATION DECEMBER, 2020

PGDCCD- I - I - DEC-2020
Max marks: 100

Time: 3 hrs

PART I: PAPER I

HUMAN BIOLOGY, SOCIAL AND BEHAVIOURAL SCIENCES, COMMUNITY
HEALTH & BIOSTATISTICS
(Answer All Questions)

Section A

(15x2=30)

- I. Write an essay about human cell with a diagram
- II. Write in details about the principles and techniques of communication
- III. Write Short Notes on

(5x4=20)

1. Median
2. Colostrum
3. Functions of WBC
4. Anaemia

Section B

(15x2=30)

- IV. Explain the structure of DNA with the help of a diagram. Write in detail about Down Syndrome (Trisomy 21)
- V. Concepts of prevention in health system. Explain in detail about the levels of prevention
- VI. Write Short Notes on

(5x4=20)

1. Turner syndrome
2. Prevention of STD's
3. Disease transmission
4. Neuromuscular junction



GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
II YEAR PGDCCO REGULAR EXAMINATION MARCH, 2021

PGDCCO- S - II - MARCH-2021
Max. marks : 100

Time : 3 hrs.

PART II PAPER-II

Early child care and education, Physical therapy Montessori, Preschool for children needing special care

(Answer All Questions)

Section A

- i. Define Intellectual Disability. Discuss in detail the preventable causes of Intellectual disability.
- ii. Discuss in detail the Community Based Rehabilitation (CBR) of Cerebral Palsy. (15x2=30)
- iii. Write Short Notes on (5x4=20)
 1. Hypotonic cerebral palsy
 2. Reading Readiness
 3. Autism
 4. Nursery Evaluation Scale Trivandrum

Section B

(15x2=30)

- i. Describe briefly about the role of play as a medium of learning in early childhood education
- ii. Discuss the Neurodevelopmental evaluation using Amiel-Tison passive angles method.
- iii. Write Short notes on (5x4=20)
 1. Vocational training for children with disability
 2. Age appropriate toys.
 3. Red flag signs of Autism
 4. Activities of daily living



GOVERNMENT OF KERALA
DIRECTORATE OF MEDICAL EDUCATION
II YEAR PGDCCO REGULAR EXAMINATION MARCH, 2023

PGDCCO-S-1-MARCH-2023
Max. marks : 100

Time : 3 hrs

PART II PAPER-I

Maternal Health, Normal & At Risk Newborns, Neonatal Follow Up Programme

(Answer All Questions)

Section A

- I Explain in detail the preventive strategies for blindness among children
- II Write about the detection of gross Motor delay among infants using CDC Grading for motor milestones (15x2=30)
- III Write Short notes (5x4=20)
 - a. LGA Baby
 - b. Umbilical Sepsis
 - c. High risk pregnancy
 - d. Developmental Quotient

Section B

- I Discuss in detail about Antenatal care
- II Write in detail about the etiology of IUGR (15x2=30)
- III Write short notes (5x4=20)
 - a. Kernicterus
 - b. Mid arm circumference
 - c. Otitis media
 - d. Social Smile

COMPETENT SIGNATURE