

गोंय विद्यापीठ ताळगांव पठार गोंय - ४०३ २०६ फोन: +९१-८६६९६०९०४८



Goa University

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(Accredited by NAAC)

GU/Acad -PG/BoS -PGDCG&MLT/2023/450

Date: 06.11.2023

Ref: GU/Acad –PG/BoS PGDCG&MLT/2022/411 dated 09.09.2022

CIRCULAR

In supersession to the above referred Circular, the updated approved Syllabus with revised Course Codes of the **Post Graduate Diploma in Clinical Genetics and Medical Laboratory Techniques** (PGDCG & MLT) Programme is enclosed.

The Dean/ Vice-Deans of the School of Biological Sciences and Biotechnology & Principals of Affiliated Colleges offering the **Post Graduate Diploma in Clinical Genetics and Medical Laboratory Techniques (PGDCG & MLT)** Programme are requested to take note of the above and bring the contents of the Circular to the notice of all concerned.

> (Ashwin Lawande) Assistant Registrar – Academic-PG

Τo,

- 1. The Dean, School of Biological Sciences and Biotechnology, Goa University.
- 2. The Vice-Deans, School of Biological Sciences and Biotechnology, Goa University.
- 3. The Dean, Goa Medical College, Bambolim- Goa.

Copy to:

- 1. The Chairperson, Board of Studies in PGDCG & MLT.
- 2. The Controller of Examinations, Goa University.
- 3. The Assistant Registrar, PG Examinations, Goa University.
- 4. Directorate of Internal Quality Assurance, Goa University for uploading the Syllabus on the University website.

Post Graduate Diploma In Clinical GeneticsAnd Medical Laboratory Techniques (Pgdcg&Mlt)

For the Academic year 2022-23

A brief description of the course:

- Purpose:Skilled development of students in Clinical Genetics and Medical Laboratory
techniques.
- Prerequisite:Science graduate with either Zoology, Microbiology, Biotechnology, Chemistry /
Biochemistry. Candidates should compulsorily obtain a minimum of 55% marks
in the PGDCG&MLT GU-ART conducted by Goa University.
- **Duration:** This Post graduate diploma shall consist of two semesters with four courses in Semesters I and II, each followed by compulsory one-month hands-on training in each of the laboratories viz. Biochemistry, Blood Bank and Central Laboratory, Pathology and Microbiology in Goa Medical College/ Govt. Hospital.
- **Course Fee:** The course fees will be decided by Goa University.

Special Feature: A collaborative teaching programme between the Department of Biochemistry, Pathology, Microbiology of Goa Medical College and Zoology, School of Biological Sciences and Biotechnology, Goa University.

Every course consists of 5 credits with 3 theory (3 x 15 hrs.) and 2 practical (2 x 30 hrs.) credits. There are eight courses accounting for a total of 40 credits distributed over two semesters. Semester one has four core courses of five credits each and semester two has four optional courses of five credits each.

All the courses will be evaluated by internal as well as external examiners.

PROGRAMME STRUCTURE

Course Code	Title of the Course	Practical Credits	Marks for Theory Credits	Marks for Practical credits	
	Semester I				
MLT-500	Clinical Genetics I	03	02	75	50
MLT-501	Clinical Biochemistry I	03	02	75	50
MLT-502	Clinical Microbiology (General &	03	02	75	50
	Systematic)				
MLT-503	Clinical Pathology & Histology	02	75	50	
Semester II					
MLT-521	Clinical Genetics II	03	02	75	50
MLT-522	Clinical Biochemistry II	03	02	75	50
MLT-523	Clinical Parasitology, Mycology and	03	02	75	50
	Virology				
MLT-524	Hematology and Transfusion medicine	03	02	75	50
+ Six months Compulsory Internship					

Note:

Each theory credit will be for 15 contact hrs and will account for 25 marks.

Each practical credit will be for 30 contact hrs and will account for 25 marks.

Semester I

Name of the Programme: PGDCG & MLT

Course Code: MLT-500

Title of the Course: Clinical Genetics I

Number of Credits: 5 Effective from AV: 2022 -2023

Lifective nom Al	. 2022 -2023	
Prerequisite for the Course:	Basic knowledge of cell biology and genetics.	
Course	• To acquaint students with recent genetic techniques	
Objectives:	• To explain the structure and function of genetic material	
-	• To evaluate structural and numerical abnormalities their inheritance patter	rnand pedigree
	analyses.	
Content:	Module 1: Introduction to Human Genetics	15 Hours
	Growth of human genetics; levels of genetics. Structure and	
	composition of the human chromosome: basic structure of DNA;	
	molecular structure and organization. Classification of Human	
	chromosomes: Paris nomenclature / ISCN; methods of studying	
	chromosomes; identification of individual chromosomes; Flow	
	Karyotyping (Quantification on DNA of individual chromosomes); FACS –	
	Fluorescence-activated cell sorter.	
	Module 2: Chromosomal Abnormalities	15 Hours
	Numerical abnormalities (somies; ploidies; mosaic; chimera; syndromes).	
	Structural: Iransiocations; Deletions; Duplications; Inversion;	
	isochromosomes; Ring chromosomes; causes for genetic abnormalities-	
	single gone disorders	
	Module 3: Pattern of Inheritance	15 Hours
	Autosomal Dominant Autosomal Recessive X-linked Dominant X-linked	15 110013
	Recessive, Y-linked, sex limited inheritance, sex influenced inheritance. X	
	inactivation. Multifactorial inheritance. mitochondrial inheritance.	
	imprinting. Pedigree analysis of some genetic disorders: Haemophilia.	
	Color blindness, Duchenne Muscular Dystrophy (DMD), achondroplasia	
	and PKU.	
	Practical Module :	
	• Specimen procurement and logging for cytogenetic procedure.	4 Hours
	Culture media preparation	4 Hours
	Identification of Chromosomes.	4 Hours
	 Inoculation of Lymphocyte culture/peripheral blood culture. 	4 Hours
	Harvesting of Lymphocyte culture to obtain metaphase plates.	4 Hours
	 Chromosomal banding technique: GTG Banding. 	4 Hours
	Karyotyping of Human chromosomes:	4 +4 +4 Hours
	 Use of Cytovision/any other Karyotyping software 	
	 Microphotography 	
	 Image capturing, image processing, and analysis 	
	Study of Karyotypes: Normal male and female and various syndromes	4+4 Hours
	Construction of Pedigree from given data.	4+ 4 Hours
	Analysis of pedigree charts to determine the mode of inheritance	
Pedagogy:	Lectures/tutorials/assignments/ Presentations/Practicals/ demonstrations	•

References/	L. Jorde, J. Carey and M. Bamshad, Medical Genetics. Fifth edition. Elsevier Publication,
Readings:	2016.
	S. D. Singh, Fundamentals of Genetics. Second Edition, Kalyani Publishers, New Delhi,
	2014.
	E. J. Gardner, M. J. Simmons and D. P. Snustad, Principles of Genetics. John Wiley
	Publication, Singapore, 2013.
	E. D. P. De Robertis, E. M. F. De Robertis, Cell and Molecular Biology. Wolter Kluwer
	Publication, Philadelphia, 2012.
	J. S. Thompson, M. W. Thompson, Genetics in Medicine. Elsevier Publication,
	Philadelphia, 1996.
	N. Arumugam, R. P. Meyyan, Advances in Genetics Volume 1. Saras Publication,
	Nagercoil, Tamil Nadu, 2016.
	A. Gardner and T. Davies, Human Genetics. Viva books publication, Delhi, 2010.
Course	By the end of this course, students will be able to
Outcome:	Understand the functions of the genetic material.
	Correlate genetic mutations to diseases in human population.
	Perform Karyotyping using software.
	Construct and analyse human pedigrees.

Name of the Programme: PGDCG & MLT Course Code: MLT-501 Title of the Course: Clinical Biochemistry I Number of Credits: 5 Credits Effective from AY: 2022 -2023

Prerequisite for the Course:	Basic knowledge of cell biology and biochemistry	
Course Objectives:	 To explain the concepts of human cell organization for further study of its role in metabolic functions To evaluate chemistry of various body enzymes, vitamins, minerals, carbohydrates, proteins and lipid. To demonstrate the estimation of the same from blood and body fluid samples such as urine etc. 	
Content:	Module 1: Cell and Physical Chemistry Cell : Cell definition, Eukaryotic cell, cell organelles and its functions, Subcellular fractionation, cell markers, cell membrane	4 Hours
	Physical Chemistry: Define:- pH, Hydrogen ion concentration and buffers, blood buffers, Regulation of blood pH, Acid Base metabolism	4 Hours
	Module 2: Carbohydrate, Lipid, Proteins (Chemistry) Carbohydrate chemistry: Definition, Classification, (Mono / Di / Polysaccharides / MPS) sources, functions & its Biomedical importance	3 Hours
	Lipid chemistry with Prostaglandins: Lipids:-Definition, Classification, Functions of Phospholipids, lipoproteins, cholesterol, Prostaglandins, Essential fatty acids	4 Hours
	Protein chemistry: Definition, Classification of proteins & aminoacids, essential amino acids, biologically important amino acids and peptides, Structure of proteins, Functions and importance of plasma proteins	3 Hours
	Haemoglobin & Hb Metabolism: Structure & Functions of Hb,Heme synthesis, Hb breakdown, Abnormal Hb	3 Hours
	Module 3: Enzymes, Vitamins and Minerals Enzymes: Definition, Classification, factors affecting enzyme action, Coenzymes, enzyme inhibition, Isoenzymes, Diagnostic enzymes	7 Hours
	Vitamins: Definition, Classification, Vitamins, RDA, dietary sources, functions, deficiency manifestations of Vitamin A, D,E,K,C, B1,B6,B12 & Folic Acid	8 Hours
	Mineral Metabolism: Digestion, Absorption, Transport, Excretion, Functions, Disorders; Dietary sources of Ca, P, Mg, Cu, Fe, I, Zinc	6 Hours
	Viva/Tutorial/ Small Group Discussion: Above all topics	3 Hours

	Practical Module:	
	 Demonstration: Estimation of pH. Use of pH meter 	4 Hours
	Qualitative Carbohydrate chemistry –Monosaccharides	4 Hours
	Qualitative Carbohydrate chemistry- Disaccharides & Polysaccharides	4 Hours
	Qualitative Protein chemistry -Colour Reactions & Precipitation	4 Hours
	Qualitative Protein chemistry -Albumin/ Globulin, Casein & Gelatin	4 Hours
	Qualitative Lipid chemistry & Estimation of Cholesterol	4 Hours
	 Estimation of Serum Proteins, A/G ratio 	4 Hours
	Estimation of chloride in serum	4 Hours
	Estimation of serum Calcium	4 Hours
	 Estimation of serum Inorganic Phosphorus 	4 Hours
	Demonstration: Chromatography	4 Hours
	Demonstration: Electrophoresis	4 Hours
	Demonstration: Colorimeter	4 Hours
	Demonstration: Autoanalyser	4 Hours
	Revision	4 Hours
Pedagogy:	Lectures/tutorials/assignments/ Presentations/Practicals/ demonstrations	
References/	1. M. A. Lieberman and R. Ricer, BRS Biochemistry, Molecular Biology, a	and Genetics.
Readings:	Wolter Kulver Publication, 2019.	
	2. D. L. Nelson and M. M. Cox, Lehninger's Principles of Biochemistry. Wiki	publications,
	2019.	
	3. R. S. Panini, Medical biochemistry-an illustrated review. Thieme Medic	al Publishers,
	New York, 2013.	
	4. D. M. Vasudevan, Textbook of Biochemistry for medical students. Jay	pee Brothers
	Medical Publishers, New Delhi, 2015.	
	5. P. Naik, Medical Biochemistry. Jaypee Brothers Medical Publishers, New D	elhi, 2019.
	 R. Sood, Medical Laboratory Technology, Jaypee Brothers Medical Publis New Delhi. 2015 	shers Pvt Ltd,
	7. Sood R(1985) first edition: Medical Laboratory Technology, Jaypee Brot	thers Medical
	Publishers Pvt Ltd, New Delhi.	
	8. K. L. Mukherjee, Volume II: Medical Laboratory Technology. Tata McGraw-	Hll Publishing
	Company Ltd. New Delhi, 2017.	
	9. G. Kamat, Practical manual of Hematology. Jaypee Brothers Medical Publi	shers Pvt Ltd,
	New Delhi, 2011.	
Course	By the end of this course, students will be able to	
Outcomes:	1. Explain the chemical organization of cells.	
	2. Compare and contrast the chemistry of biomolecules.	
	3. Perform quantitative and qualitative tests for biomolecules.	
	Estimate enzymes and minerals from serum.	

Name of the Programme: PGDCG & MLT Course Code: MLT-502 Title of the Course: Clinical Microbiology (General & Systematic) Number of Credits: 5 Effective from AY: 2022 -2023

Prerequisite for the Course:	Basic knowledge of cell biology and microbiology	
Course	• To provide hands-on training on the preparation of culture media for the	isolation of
Objectives	hactoria from blood or body fluid camples provided	
Objectives.	bacteria from blood or body fiuld samples provided.	
	 To be aware of diagnostic features of bacteria for reporting the correct result 	lits observed
	after analyses using definite procedures	
	 To explain advanced techniques used in recent times to obtain better and f 	aster results
	to provide immediate treatment.	
Content:	Module 1: Introduction to microbiology	15 Hours
	Historical perspective, the principle of microbiology, microscopes (types	
	and uses). Bacteria: Classification, anatomy, reproduction, growth and	
	nutrition Sterilization: - methods employed both physical and chemical	
	Media used in Microbiology: - Classification types constituents methods	
	of proparation adjustment of pH starilization. Culture methods and	
	of preparation, augustiment of pri, sternization, culture methods and	
	antimicropial sensitivity testing, Hospital acquired infections, Biomedical	
	waste Management, Inventory and stock, Quality control in Microbiology.	
	Module 2: Serology	15 Hours
	Serology: Antigen, antibody, antigen-antibody reaction including flow	
	cytometry, Methods for identification of bacteria (morphology), Methods	
	for identification of bacteria (biochemical), Molecular methods (PCR,	
	Biofire Film Array, LAMP), Automated systems for bacterial identification	
	(MALDI-TOF, VITEK 2), Automated culture techniques, Standard	
	precautions.	
	Module 3: Systemic (Individual Bacteria)	15 Hours
	Systemic (Individual Bacteria): Diagnosis features (morphology, cultured	
	characters biochemical reaction antigenic characters nathogenicity and	
	laboratory diagnosis) of Stanbylococcus Strentococcus Pneumococcus	
	Noiscoria Corunobactoria Clostridia Escherichia coli Klobciella species	
	Reisseria, Corynebacteria, Clostifula, Escherichia con, Riebsiena species,	
	Salmonella, Shigella, Proteus, Pseudomonas, <i>Mycobacterium tuberculosis</i> ,	
	Treponema pallidum.	
	Practical Module :	30 Hours x 2
	• Preparation of smears for staining and fixation from samples and culture	
	media (both liquid and solid media).	
	 Care and use of microscopes (including Fluorescent microscope). 	
	• Staining techniques: (Gram staining, zeihl nelson, Fluorescent method):	
	preparation of satins, procedure, reporting of smears, principle involved.	
	• Equipments used in sterilization: Description (structure), working principle	
	involved, articles sterilized, advantages and disadvantages.	
	Culture media: types, constituents of each media, method of preparation	
	adjustment of pH, sterilization, uses.	
	Culture techniques: different methods of inoculation from clinical samples	
	and hacterial growth from media	
	 Antimicrobial constituity testing 	
	- Antimicropial sensitivity testing.	

	 Preparation of wet mount and motility of organisms.
	 Identification of bacteria-morphology and biochemical.
	Antigen antibody reactions.
	Biomedical waste management.
	Standard precautions.
	Systemic bacteriology: Practical demonstration of diagnostic features of:
	 Gram positive organisms.
	 Gram negative organisms.
	 Anaerobes, spirochetes.
	Mycobacteria.
Pedagogy:	Lectures/tutorials/assignments/ Presentations/Practicals/ demonstrations.
References/	1. R. Kanungo and S. Saxena (Ed), Ananthanarayan and Paniker's Textbookj of
Readings:	Microbiology. Universities Press (India), 2022.
	2. A. S. Satry and S. Bhat, Essential of Medical Microbiology. Jaypee Brothers Medical
	Publishers, 2019.
	3. C. P. Baveja and V. Baveja, Complete microbiology. Avichal Publishing Company; 2021.
Course	By the end of this course, students will be able to
Outcomes:	1. Explain the basis of bacterial culture and identification.
	2. Correlate the microbial techniques with clinical conditions in humans.
	3. Perform various staining techniques and tests for microbial analysis.
	4. Process body samples to detect pathogenic bacteria.

Name of the Programme: PGDCG & MLT Course Code: MLT-503 Title of the Course: Clinical Pathology & Histology Number of Credits: 5 Effective from AY: 2022 -2023

Prerequisite	Basic knowledge of Anatomy and Physiology.	
for the Course:	To ovalain techniques of collection of complex such as hedy fluids and tissue	os for
Objectives:	 To explain techniques of collection of samples such as body hulds and tissu studying cytological aspects 	
	 To provide hands-on training in learning techniques of processing the tissue 	e samples.
	 To explain analysis and treatment of particular diseases. 	
Content:	Module 1: Histopathological techniques	15 Hours
	Fixatives and fixation, Preparation of fixatives , Neutral formalin,	
	buffered formalin, mercuric Zenker's sol. Schaudinns sol, k-dichromate-	
	orth's solution Regaud's sol picric acid – Bouins sol: Hollande's sol.	
	clearing, embedding, microtome knives, section cutting, errors,	
	decalcification, Decalcifying fluids, formic acid, gooding & stewarts fluid,	
	nitric acid, aqueous nitric acid. frozen section, mounting media,	
	automation. Staining: Theory of staining, dyes and stains, mordants,	
	differentiation, haematoxylin and eosin staining- principles and	
	procedures, Hematoxylin stains: composition and techniques	
	preparations & application of , from hematoxylins , weigert's from	
	PTAH Molyhdenum Hematoxylin phonhomdybdic acid hematoxylin	
	special stains, carbohydrate stins and glycoconiugates, P.A.S. alcian blue	
	techniques combine alcian blue – PAS, muciccarmine, colloidal iron.	
	high iron diamine. Lipid staions, oil red o , suddan black b., pigments and	
	minerals perls pursian blue for ferric iron , masson Fontana method for	
	melanin, von kossa for calcium.elastic tissue stains, weigert method,	
	Verhoff's, method Connective tissue stains, history of connective tissue	
	composition preparation and application of Masson's trichrome, Von	
	Giessons, Reticulin stain Gomoris silver methanamine. fat stains, and	
	other stains. Microorganism , Grams method & modified method , Z N	
	stains for mycobacteria, fluorescent method for mycobacteria, modified	
	fite method for mycobacteria leprac, cresyl violet stains for helicobacter,	
	grocott methamine silver for fungi, Mc manus PAS method for glycogen	
	& Tungai wali, Amylaid congo rod tochniquos	
	Module 2: Examination of body fluids	15 Hours
	Sample collection, physical and chemical tests, principles and methods,	15 110015
	reagent strip method, microscopic examination- crystals, casts,	
	sediments, pregnancy tests. Stool examination, semen analysis, sputum	
	examination.	
	Cytocentrifugation and application	
	Lab diagnosis/ urine/ blood/ findings in kidney disorders.	
	Module 3: Cytological techniques	15 Hours
	Exfoliative cytology, fixation, pap staining, cytological processing of	
	fluids. Fine needle aspiration cytology (FNAC): procedure, staining of	
	slides, automation, H & E and MGG staining. Examination of CSF and	

	 other body fluids: pleural, peritoneal, synovial fluid. Quality control in clinical pathology lab, automation in clinical pathology lab. enzyme histochemistry and its diagnostic application, immuno histochemicals techniques, tissue microarray, molecular pathology techniques In situ hybridation/ F.I.S.H Practical Module: Histopathological techniques: fixation, dehydration, clearing, impregnation, embedding, decalcification.microtome's , base sledge, rocking type, rortary, sliding microtome, autotechnicon automated tissue processor, principle, working, paraffin embedding bath etc. Microtomes knives and their sharpening, automated knives sharpners section cutting, errors in section cutting, refregirated micotome, freezing micotome , cryostat etc. frozen sectioning, mounting media. Routine staining techniques: routine staining, hematoxylin and eosin (H &E) staining. Special staining demonstration: P.A.S., Verhoeff's, Massons trichrome, Von Giessons, fat stains and other stains. Grossing and Museum techniques. Examination of urine: multiple reagent strips methods, microscopic.Urinometer, ESbach's Albuminometer, automated urine analyser, dipstick readers etc. Pregnancy tests. C.S.F. examination Examination of body cavity fluids: pleural, peritoneal, and synovial. 	30 Hours x 2
	 Exfoliative cytology: principles, Papanicolaou staining procedure. Fine needle aspiration cytology (F.N.A.C): hematoxylin and eosin (H &E), MGG staining. Needles lumbar puncture needle, vim silverman needle, bone marrow aspiration biopsy needle, trephine biopsy needle etc. Miroscopes, compound, dark ground illumination, phase contrast, fluroscopt microscopy, polarizing microscopy. 	
Pedagogy:	Lectures/tutorials/assignments/ Presentations/Practicals/ demonstrations	
References/ Readings:	 M. A. Lieberman and R. Ricer, BRS Biochemistry, Molecular Biology a Lippincott Williams and Wilkins, 2019. S. M. Kawthalkar, Essential of Clinical Pathology. Jaypee Medical publisher 2018. D. M. Vasudev, Textbook of Biochemistry for medical students. Jay Medical Publishers Pvt Ltd, New Delhi, 2013. R. Sood, Medical Laboratory Technology. Jaypee Brothers Medical Publical Publishers Delhi, 2009. P. Chakraborty, A text book of microbiology, New Central Book Agency, Cal 	and Genetics. rs, New Delhi, pee Brothers plishers, New cutta, 2009.
	6. A. C. Dereck and I. R. Cameron, Histopathology Specimens: Clinical, Pat Laboratory Aspects, Springer publication, 2019.	hological and

	7. H. Mohan, Practical pathology. Jaypee Medical publishers, New Delhi, 2017.
	8. K. L. Mukherjee, Medical Laboratory Technology, Tata McGraw-Hll Publishing Company
	Ltd. New Delhi, 2017.
	9. M. N. Chatterjee, Textbook of Medical Biochemistry eight edition: Jaypee Brothers
	Medical Publishers, New Delhi, 2013.
Course	By the end of this course, students will be able to
Outcomes:	1. Describe and demonstrate staining techniques for pathological evaluations.
	2. Perform different techniques used for examining body fluids.
	3. Process tissue and perform histopathological techniques.
	4. Examine body sample for pathological analysis.

Semester II Name of the Programme: PGDCG & MLT Course Code: MLT-521

Title of the Course: Clinical Genetics II

Number of Credits: 5 Effective from AY: 2022 -2023

Prerequisite	Basic knowledge of Cell biology and genetics	
for the Course:		
Course Objectives:	 To get acquainted with recent procedures used in artificial reproductive te (ART) and their acceptance in society. To explain ART Techniques for analysis of samples for the success of proced conducted. To analyze the recent techniques used for better results and treatment. To learn about genetic counseling and steps to help guide patient for part treatment available. 	chniques dures icular medical
Content:	Module 1: Molecular genetics, Genetics of Cancer, Dermatoglyphics Molecular genetic techniques used in genetic diagnosis: Blotting techniques – Southern, Northern and Western, PCR/ RFLP, FISH, DNA sequencing & DNA fingerprinting. Genetics of Cancer: introduction, characteristics of cancer cells, origin of cancer cells, genes associated with cancer, environmental causes of cancer, human genome data tailor diagnosis and treatment. Dermatoglyphics: Introduction, classification, Flexion creases. Dermatoglyphics in clinical disorders, Clinical application & its advantages and limitations	15 Hours
	 Module 2: Reproductive technologies, Genetics and Society Reproductive technologies: infertility and subfertility, assisted reproductive technologies (IUI, surrogate motherhood, IVF, GZIT, ZIFT), preimplantation genetic diagnosis. Genetics and Society : (i) Human genome project : (ii) Forensic science (iii) DNA finger printing application (iv) Gene therapy (v) Eugenics. vi) Stem cell research. Module 3: Prenatal Diagnosis, Genetic Counselling Prenatal Diagnosis: Definition: Various procedures - Amniocentesis, Chorionic villus sampling, Ultrasonography and Fetoscopy. Genetic Counselling (Stage1: History and Pedigree Construction, Stage 2: Examination, Stage 3: Diagnosis, Stage 4: Counselling; and Stage 5: Follow up). 	15 Hours 15 Hours
	 Practical Module: Introduction to molecular genetic lab: general rules, handling of chemicals, equipments and biological materials; waste disposal. Isolation of DNA from human blood. Determination of the molecular size of DNA. Analysis of DNA fingerprints and FISH images Dermatoglyphics: Recording of print of fingertips and palm. Manual DNA sequencing and data analysis. Amniotic fluid culture: Flask method and Coverslip method. Chorionic villi culture: Short-term culture Chromosomal analysis from the product of conception (abortus study) (03 Practicals) 	30 Hours x 2

	•	Disease suspection by spot tests: Fanconi's syndrome, PKU, maple syrup urine disease, Tryptophanuria.
Pedagogy:		Lectures/tutorials/assignments/ Presentations/Practicals/ demonstrations.
References/Rea	1.	L. Jorde, J. Carev and M. Bamshad, Medical Genetics, Fifth edition, Elsevier Publication,
dings:		2016.
	2.	S. D. Singh, Fundamentals of Genetics. Second Edition, Kalyani Publishers, New Delhi, 2014.
	3.	E. J. Gardner, M. J. Simmons and D. P. Snustad, Principles of Genetics. John Wiley Publication, Singapore, 2013.
	4.	E. D. P. De Robertis, E. M. F. De Robertis, Cell and Molecular Biology. Wolter Kluwer Publication, Philadelphia, 2012.
	5.	J. S. Thompson, M. W. Thompson, Genetics in Medicine. Elsevier Publication, Philadelphia, 1996.
	6.	N. Arumugam, R. P. Meyyan, Advances in Genetics Volume 1. Saras Publication, Nagercoil, Tamil Nadu, 2016.
		A. Gardner and T. Davies, Human Genetics. Viva books publication, Delhi, 2010.
Course		By the end of this course, students will be able to
Outcomes:	1.	Describe and explain the molecular genetic techniques used in genetic diagnosis and
		reproductive techniques which can be recommended to overcome infertility.
	2.	Demonstrate the application of dermatoglyphic prints in disease detection.
	3.	Perform procedures of DNA isolation, Molecular size determination, and disease
		detection for inborn errors of metabolism.
	4.	Analyze FISH images and DNA fingerprints.

Name of the Programme: PGDCG & MLT Course Code: MLT-522 Course Title: Clinical Biochemistry II Number of Credits: 5 Effective from AY: 2022 -2023

Prerequisite for the Course:		Basic knowledge of cell biology and biochemistry.	
Course Objectives:	•	To explain tests, observation and analysis of blood function test To provide knowledge about the Clinical aspects and use of it during the per- test. To provide hands-on training in biochemical tests.	formance of a
Content:		Module 1: Carbohydrate, Protein, Lipid Metabolism Carbohydrate Digestion, Absorption & Metabolism: Digestion & Absorption of Carbohydrates, Glycolysis, TCA cycle, Gluconeogenesis, Glycogen Metabolism, DM, Ketosis, Blood Glucose and its regulation; Hypoglycemia	9 Hours
		Lipid Digestion, Absorption & Metabolism: Digestion & Absorption of Lipids, ketone body metabolism, lipoprotein metabolism, Atherosclerosis. Normal Lipid profile	9 Hours
		Protein Digestion, Absorption & Metabolism: Digestion & Absorption of Proteins, Transamination, Deamination, Urea cycle, Functions of Glycine Phenylalanine, Tyrosine, Tryptophan, Phenylketonuria, Alkaptonuria , Albinism, Maple syrup urine disease, Kwashiorkar & Marasmus	9 Hours
		Water & Electrolyte Balance: Electrolyte balance (Na, K & Cl) and Imbalance	2 Hours
		Module 2: Function Tests 1 Cardiac Function Tests: Cardiac Markers, tests used to estimate risk of CVD	2 Hours
		Gastric Function Tests: Gastric function and HCL secretion, Gastric juice analysis Module 3: Function Tests 2	2 Hours
		Liver Function Tests: Tests based on excretory, detoxification, synthetic functions of liver, Enzymes in diagnosis of liver diseases	4 Hours
		Pancreatic Function Tests: Pancreatic juice, functions, Assessment of Pancreatic functions	1 Hour
		Thyroid Function Tests: Thyroid gland functions, Classification of thyroid function tests	1 Hour
		Kidney Function Tests: Glomerular and Tubular functions, Normal and Abnormal constituents of Urine, Renal clearance tests, Tests for tubular functions	3 Hours
		Viva/Tutorial/ Small Group Discussion: All above topics	3 Hours
		Practical Module:	4.1
	•	Chemistry of gastric juice	4 Hours
	•	Demonstration: Quality Control	4 Hours
	•	Estimation of Dillrubin	4 Hours
	•	Estimation of glucose in blood	
		Estimation of blood uroa	
	•		4 Hours

	•	Estimation of creatinine in blood	4 Hours
	•	Estimation of uric acid in blood	4 Hours
	•	Normal urine	4 Hours
	•	Full urine report	4 Hours
	•	Demonstration: Kidney function tests, Thyroid function tests	4 Hours
	•	Demonstration: Liver function tests, Cardiac function tests	4 Hours
	•	Demonstration: Lipid Profile	4 Hours
	•	Demonstration: C. S. F. Examination	4 Hours
	•	Revision	4 Hours
Pedagogy:		Lectures/tutorials/assignments/ Presentations/Practicals/ demonstrations	•
References/Rea	1.	M. A. Lieberman and R. Ricer, BRS Biochemistry, Molecular Biology, a	and Genetics.
dings:		Wolter Kulver Publication, 2019.	
	2.	D. L. Nelson and M. M. Cox, Lehninger's Principles of Biochemistry. Wiki	publications,
		2019.	
	3.	R. S. Panini, Medical biochemistry-an illustrated review. Thieme Medic	al Publishers,
		New York, 2013.	
	4.	D. M. Vasudevan, Textbook of Biochemistry for medical students. Jay	pee Brothers
		Medical Publishers, New Delhi, 2015.	
	5.	P. Naik, Medical Biochemistry. Jaypee Brothers Medical Publishers, New De	elhi, 2019.
	6.	R. Sood, Medical Laboratory Technology, Jaypee Brothers Medical Publis	shers Pvt Ltd,
		New Delhi, 2015	
	7.	K. L. Mukherjee, Volume II: Medical Laboratory Technology. Tata McGraw-	Hll Publishing
	~	Company Ltd. New Delhi, 2017.	
	8.	G. Kamat, Practical manual of Hematology. Jaypee Brothers Medical Publi	shers Pvt Ltd,
		New Deini, 2011.	
Course		By the end of this course, students will be able to	
Outcomes:	1.	Perform and explain clinical significance of metabolism of biomolecules.	
	2.	Evalute the significance of function tests of body systems.	
	3.	Perform Chemical examination of body fluids.	
	4.	Conduct Liver, Thyroid and Kidney function tests.	

Name of the Programme: PGDCG & MLT Course Code: MLT-523 Title of the Course: Clinical Parasitology, Mycology and Virology Number of Credits: 5 Effective from AY: 2022 -2023

Prerequisite	Basic knowledge of pathogens and their characteristics.	
for the Course:		
Course	 To explain parasitological, mycological and virological aspects, their life cycl 	e.
Objectives:	 To describe clinical aspects of the same for analyses and treatment. 	
	 To make aware of virus spread and tests performed for the same for their a 	nalyses
Content:	Module 1: Parasitology	15 Hours
	Introduction to parasitology, terminologies, definitions, relationships.	
	Protozoa: geographic distribution, habitat, morphology, life cycle,	
	pathologenecity, laboratory diagnosis of the following parasites:	
	 Entamoeba histolytica 	
	 Giardia lamblia 	
	 Trichomonas vaginalis 	
	 Leishmania donovani 	
	 Plasmodium 	
	 Cocoidian parasites causing diarrhea 	
	Cestodes: On the same line as protozoan parasites for the following:	
	 Taenia sagenata 	
	 Taenia solium 	
	Echinococcus granulosus	
	Helminths: On the same line as protozoan parasites for the following:	
	 Trichuris trichiura 	
	Ankylostoma duodenale	
	 Ascaris lumbricularis 	
	 Enterobius vermicularis Montesaria hanna fii 	
	■ Wuchereria bancrofti	
	Wodule 2: Wycology	15 Hours
	Introduction to mycology, classification of fungi and fungal diseases,	
	candida species Dermatenbytes Cryptosessus Opportunistis fungi	
	(Aspargillus Papeillium Mucar) Subcutanous mycosos (Mycotoma	
	(Asperginus, Fencinium, Mucor), Subcutaneus mycoses (Mycetoma, Sporotrichosis Rhinosporidiosis) Histoplasmosis Eurgal tovins	
	Module 3: Virology	15 Hours
	General virology: Definations classification properties of viruses viral	15 110013
	replication cultivation laboratory diagnosis	
	 Systemic virology: On the basis of structure, cultivation 	
	nathogenicity Laboratory diagnosis of the following viruses:	
	i) Bacterionhage	
	ii) Picomaviruses (Polio viruses)	
	iii) Rhabdoviruses (Rbies virus)	
	iv) Arboviruses(Dengue, Chikungunva, JE)	
	v) Influenza virus	
	vi) Hepatitis virus	
	vii) HIV	
	viii) Herpes virus	

		Practical Module:	30 Hours x 2
	•	Stool examination: gross, microscopic, for adult parasite, segment of	
		Taenia, ova, cysts, and larvae of parasite .	
	•	Gross and microscopic features (whenever applicable) of intestinal/	
		vaginal protozoa.	
	•	Laboratory diagnosis of malaria: demonstration of whole parasite,	
		parasite antigen, enzymes, serology.	
	•	Gross and microscopic features of cestodes: to include adult worms,	
		segment, larvae, eggs.	
	•	Gross and microscopic features of Helminthes: to include adult worms,	
		eggs, larvae.	
	•	Diagnostic features-practical demonstration of gross and microscopic	
		features (wet mount, slide culture) and other tests whenever applicable	
		fungi	
		Tungi.	
		cultivation in embryonated egg	
		Laboratory diagnosis of the following viruses: Poliovirus Rhabdovirus	
		HIV Henatitis Hernes Influenza Arboviruses	
	•	Bacterionhage—structure using a model	
Pedagogy:	-	Lectures/tutorials/assignments/ Presentations/Practicals/ demonstrations	
References/Rea	1.	B. Kanungo and S. Saxena (Ed). Ananthanarayan and Paniker's	Textbooki of
dings:		Microbiology. Universities Press (India), 2022.	· • · · · · · · · · · · · · · · · · · ·
	2.	A. S. Satry and S. Bhat, Essential of Medical Microbiology. Jaypee Bro	thers Medical
		Publishers, 2019.	
	3.	C. P. Baveja and V. Baveja, Complete microbiology. Avichal Publishing Com	pany; 2021.
Course		By the end of this course, students will be able to	
Outcomes:	1.	Describe the pathogenicity and laboratory diagnosis of protozoans, Cestod	les, and
		Helminthes.	
	2.	Know the basis of identification and classification of Fungi and viruses.	
	3.	Perform Gross and microscopic observation procedures for detecting endo	oparasites.
	4.	Analyze the viral infections and their effects.	

Name of the Programme: PGDCG & MLT Course Code: MLT-524 Course Title: Hematology and Transfusion medicine Number of Credits: 5 Effective from AY: 2022 -2023

Prerequisite for the Course:	Basic knowledge of blood components and their applications	
Course	 To get acquainted to blood collection and analyses of blood 	
Objectives:	 To learn various components of blood 	
Objectivesi	 To evaluate importance of blood donation and learn grouping systems 	
Content [.]	Module 1: Hematology–Blood composition and Hemolytic disorders	15 Hours
content.	Blood: composition, haemopoesis, RBC'S- structure function, synthesis: Hemoglobin- structure, function, abnormal haemoglobin, reticulocytes, blood indices, peripheral blood smear, parasites in blood. Hemolytic disorders: investigations, screening tests, sickling, osmotic fragility, Heinz bodies, G-6-P-D screening, Hb electrophoresis, Hb-F estimation. Applied pathology, lab diagnosis of anemia, lab diagnosis and CSF picture in diff types of meningitis, lab diagnosis of hemorrhages disorders, lab diagnosis and LFT findings in diff types of jaundice, lab diagnosis Module 2: WBCs and Platelets White blood corpuscles: Description, morphology, leucocyte, counts, leucopenia, leukocytosis, leukemia,	15 Hours
	leukemoid reaction, absolute counts, leukopenia, leukocytosis, leukemia, leukemoid reaction, absolute count, differential count, bone marrow iron staining, special stains for leukemias. Platelet structure and function: Bleeding disorders and investigations, coagulation process and theory, disorders. Flow cytometry and application.	15 Hours
	Module 3: Transfusion medicine Blood groups: ABO and sub groups, antigen and antibodies, Rh blood grouping, other blood group systems, compatibility testing, antihuman globulin test. Blood transfusion: Selection of blood donors, blood transfusion procedures, Complications of blood transfusion, Blood component therapy, organization and administration of blood bank, blood safety. Equipments for blood component separation in blood bank, refrigerated centrifuge, plasma expresser, refrigerated water bath, laminar air flow bench etc. Administrations and medico legal aspects, accreditation of lab.	15 Hours
	Practical Module:	30 Hours x 2
	Anticoagulants and blood collection	
	 Haemoglobinometry: Sahli's method, Cyanmethemoglobin method.colori meter / spectrophotometer , principles part workings Coagulometer 	
	 Haemoglogin electrophoresis, agar gel, CAM, HPLC, capillary electrophoresis etc. 	
	 Hematology analyser , 3 part/5 part differential counters (cell counter, semi automated, fully automated) 	
	Haemocytometry: Erythrocyte count ,RBC pipette	
	Haemocytometry: Total WBC count, WBC pipette	
	Blood smear preparations: Staining, differential WBC count	
	Peripheral blood smear examination and morphological abnormalities	

	•	Hemolytic work-up osmotic fragility test, Heinz bodies, sickling, G-6-P-D
		estimation, Hb-electrophoresis, Hb-F estimation.
	•	Reticulocyte count- absolute eosinophil count
	•	E.S.R, P.C.V, Blood indices (02 Practicals)
	•	Platelet count, BT, CT, CRT
	•	Prothrombin time, A.P.P.T, FDP estimation
	•	Bone marrow examination- staining of smear, special stains- PAS, Sudan
		black, Myeloperoxidase
	•	ABO grouping and Rh typing.
	•	Demonstration of Coombs test and compatibility testing.
Pedagogy:		Lectures/tutorials/assignments/ Presentations/Practicals/ demonstrations.
References/Rea	1.	G. H. Rao, T. Eastlund and L. Jagannath, Handbook Of Blood Banking & Transfusion
dings:		Medicine. Jaypee Medical Publishers, New Delhi, 2006.
	2.	A.B. Dutta, Blood Banking and Transfusion. CBS Publishers, New Delhi, 2006.
	3.	S. V. Rudmann, Textbook of Blood Banking and Transfusion Medicine. Second Edition.
		Elsevier Saunders Publication, 2005.
	4.	K. Bharadwaj, Transfusion Update. Indian Society of Blood Transfusion and
		Immunohaematology. Jaypee Medical Publishers, New Delhi, 2005.
	5.	K. L. Mukherjee, Volume II: Medical Laboratory Technology, Tata McGraw-Hll Publishing
		Company Ltd. New Delhi, 2007.
	6.	G. Kamat, Practical manual of Hematology. Jaypee Brothers Medical Publishers, New
		Delhi, 2011.
Course		By the end of this course, students will be able to
Outcomes:	1.	Explain the composition of blood and changes in Hemolytic disorders.
	2.	Describe the structure and functions of WBCs and explain the tests associated with
		detection of Hemolytic disorders.
	3.	Perform various hemocytometric procedures.
	4.	Perform various hematological tests for disease detection.