Parvatibai Chowgule College of Arts & Science (Autonomous)

Course Structure and Syllabus

POST GRADUATE DIPLOMA IN CLINICAL GENETICS AND MEDICAL LABORATORY TECHNIQUES (PGDCG&MLT)

Revised March 2020

COURSE STRUCTURE
POST GRADUATE DIPLOMA IN
CLINICAL GENETICS AND MEDICAL LABORATORY TECHNIQUES
(PGDCG&MLT)

SEMESTER	COURSE CODE	CORE COURSES	ELECTIVE COURSES (Any 0ne)	NUMBER OF CREDITS	CONTACT HOURS	MARKs
SEMESTER I	PGD-CGMLT-C1	Clinical Genetic Techniques I		Theory = 03 Practical = 01	Theory = 45 Practical = 30	Theory = 50 Practical = 50
	PGD-CGMLT-C2	Clinical Biochemistry I		Theory = 03 Practical = 01	Theory = 45 Practical = 30	Theory = 50 Practical = 50
	PGD-CGMLT-C3	Clinical Microbiology (General and Systemetic)		Theory = 03 Practical = 01	Theory = 45 Practical = 30	Theory = 50 Practical = 50
	PGD-CGMLT-E1		Clinical Pathology and Histopathology	Theory = 03 Practical = 01	Theory = 45 Practical = 30	Theory = 50 Practical = 50
	PGD-CGMLT-E2		SWAYAM course: Analytical Techniques	Theory = 04 credits	Swayam Online	Theory = 100
	PGD-CGMLT-E3		SWAYAM course: Essentials Of Biomolecules: Nucleic Acids And Peptides	Theory = 04 credits	Swayam Online	Theory = 100
SEMESTER	**COURSE CODE**	**CORE COURSES**	**ELECTIVE COURSES (Any 02)**	**NUMBER OF CREDITS**	**CONTACT HOURS**	**MARKs**
SEMESTER II	PGD-CGMLT-C4	Clinical Genetic Techniques II		Theory = 03 Practical = 01	Theory = 45 Practical = 30	Theory = 50 Practical = 50
	PGD-CGMLT-C5	Clinical Biochemistry II		Theory = 03 Practical = 01	Theory = 45 Practical = 30	Theory = 50 Practical = 50
	PGD-CGMLT-E4		Clinical Parasitology, Mycology and Virology	Theory = 03 Practical = 01	Theory = 45 Practical = 30	Theory = 50 Practical = 50
	PGD-CGMLT-E5		Hematology and Transfusion Medicine	Theory = 03 Practical = 01	Theory = 45 Practical = 30	Theory = 50 Practical = 50
	PGD-CGMLT-E6		SWAYAM course-Biomolecules: Structure, Function In Health And Disease	Theory = 04 credits	Swayam Online	Theory = 100
	PGD-CGMLT-E7		SWAYAM course-Immunology	Theory = 04 credits	Swayam Online	Theory = 100
Internship (Elective)	03-06 months internship at Hospital/Clinics.			08 credits		Report/Portfolio = 100

COURSE SYLLABUS: SEMESTER I (03 Core + 1 Elective course)

CORE COURSE: CLINICAL GENETICS- I	
COURSE CODE:	PGD-CGMLT-C1
MARKS:	100 [50 – Theory : 50 – Practical]
CREDITS:	04 [03 – Theory : 01 – Practical]
CONTACT HOURS	THEORY : 45 HOURS (03 LEC/WEEK) PRACTICALS : 30 HOURS (01 PRACTICAL / WEEK)
COURSE OBJECTIVES:	• Acquaint students with recent genetic techniques • Know about the structure and function of genetic material • Learn about structural and numerical abnormalities their inheritance pattern and pedigree analyses.
COURSE OUTCOME	On completion of the course the student should be able to: CO 1: Understand the functions of the genetic material. CO 2: Correlate genetic mutations to diseases in human population. CO 3: Perform Karyotyping using software. CO 4: Construct and analyse human pedigrees.

PGD-CGMLT-C1**: CLINICAL GENETICS I**		
MODULE	**TOPICS**	**CONTACT HOURS**
Module 1: Introduction to Human Genetics	• Growth of human genetics; levels of genetics. • Structure and composition of the human chromosome: basic structure of DNA; molecular structure and organisation. • 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.	15
Module 2: Chromosomal Abnormalities	• Numerical abnormalities (somies; ploidies; mosaic; chimera; syndromes.) • Structural: Translocations; Deletions; Duplications; Inversion; isochromosomes; Ring chromosomes; causes for genetic abnormalities- meiotic and mitotic nondisjunction; uniparental disomy; mutations; single gene disorders.	15
Module 3: Pattern Of Inheritance	• Autosomal Dominant, Autosomal Recessive, X-linked Dominant, X-linked 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.	15

PRACTICAL COMPONENT OF PGD-CGMLT-C1: CLINICAL GENETICS I [DURATION – 02 HRS/WEEK]	
Practical	**No. of Practicals**
1. Specimen procurement and logging for cytogenetic procedure. 2. Culture media preparation (02 practicals) 3. Identification of Chromosomes. 4. Inoculation of Lymphocyte culture/peripheral blood culture. 5. Harvesting of Lymphocyte culture to obtain metaphase plates. 6. Chromosomal banding technique: GTG Banding. 7. Karyotyping of Human chromosomes: (03 practicals) - use of Cytovision / any other Karyotyping software - Microphotography - Image capturing, image processing, and analysis 8. Study of Karyotypes: Normal male and female(2 practicals) 9. Construction of Pedigree from given data. 10. Analysis of pedigree charts to determine the mode of inheritance(02 practicals)	15

REFERENCE BOOKS:

1. *Jorde L, Carey J and Bamshad M(2016). Medical Genetics. Fifth edition. Elsevier Publication imprint. eBook ISBN: 9780323391979.*
2. *Singh BD (2014): Fundamentals of Genetics. Second Edition, Kalyani Publishers, New Delhi.*
3. *Matheiesen A and Roy K(2018). Foundation of Perinatal Genetic counseling. eISBN: 9780190681111*
4. *Gardner EJ, Simmons MJ and Snustad DP (2013): Principles of Genetics, Eighth Edition, John Wiley Publication, Singapore*
5. *De Robertis EDP, De Robertis EMF (2012): Cell and Molecular Biology, Eigth Edition. Wolter Kluwer Publication, Philadelphia.*
6. *Thompson JS, Thompson MW(1966): Thompson & Thompson Genetics in Medicine ,Elsevier Publication, Philadelphia.*

REFERENCE BOOKS FOR PRACTICALS:

7. *Arumuga N, MeyyanRP(2016): Advances in Genetics Volume 1(Dr. N. Arumugam, R P Meyyan, Saras Publication, Nagercoil, Tamil Nadu.*
8. *GardnerA and Davies T(2010) Human Genetics 2nd Edition,Viva books publication,Delhi.*

CORE COURSE: CLINICAL BIOCHEMISTRY I	
COURSE CODE:	PGD-CGMLT-C2
MARKS:	100 [50 – Theory : 50 – Practical]
CREDITS:	04 [03 – Theory : 01 – Practical]
CONTACT HOURS	THEORY : 45 HOURS (03 LEC/WEEK) PRACTICALS : 30 HOURS (01 PRACTICAL / WEEK)
COURSE OBJECTIVES:	• Understanding concepts of human cell organization for further study of its role in metabolic functions • Study of chemistry of various body enzymes, vitamins, minerals, carbohydrates, proteins and lipid for further estimation of the same from blood and body fluid samples such as urine etc.
COURSE OUTCOME	On completion of the course the student should be able to: CO 1: Explain the chemical organization of cells CO2: Compare and contrast the chemistry of biomolecules. CO 3:Perform quantitative and qualitative tests for biomolecules. CO4: Estimate enzymes and minerals from serum.

PGD-CGMLT-C2: CLINICAL BIOCHEMISTRY I		
MODULE	**TOPICS**	**CONTACT HOURS**
Module 1: The scope of biochemistry	• Chemical organization of the cell. • Organic and inorganic components of the cell. • Marker enzymes of the cell. • Hydrogen ion concentration and buffers: pH • Blood buffers, regulation of blood pH. • Acid base metabolism.	15
Module 2: Carbohydrate ,Proties,Lipid (Chemistry)	• Carbohydrate chemistry. • Protein chemistry. • Lipid chemistry.	15
Module 3: Enzymes, Vitamins and Minerals)	• Enzymes: Definition, classification, factors affecting enzyme action. • Enzyme inhibition, • Isoenzymes, • Regulation of enzyme activity. • Vitamins. • Minerals.	15

PRACTICAL COMPONENT OF PGD-CGMLT-C2: CLINICAL BIOCHEMISTRY I

[DURATION – 02 HRS/WEEK]	
Practical	**No. of Practicals**
The scope of biochemistry 1. Estimation of pH. Use of pH meter. 2. Estimation of haemoglobin by 'cyanmeth haemoglobin' **Carbohydrate, Proties, Lipid (Chemistry)** 3. Qualitative and quantitative Carbohydrate chemistry(02 Practicals) 4. Qualitative and quantitative Protein chemistry (02 Practicals) 5. Qualitative and quantitative Lipid chemistry(02 Practicals) **Enzymes, Vitamins and Minerals** 6. Estimation of chloride in serum (02 Practicals) 7. Estimation of serum calcium (02 Practicals) 8. Estimation of serum inorganic phosphorus. 9. Separation of amino acid and its identification by paper chromatography - Demonstration 10. Estimation of serum Na+/ K+ ions by Flame photometer- Demonstration	15

REFERENCE BOOKS:

1. *Lieberman MA and Ricer R(2019). BRS Biochemistry, Molecular Biology, and Genetics.Wolter Kulver Publication.*
2. *Nelson DL and Cox MM(2019). LehningerPrinciples of Biochemistry, Seventh edition. Wiki publications.*
3. *Panini RS(2013).Medical biochemistry – an illustrated review. Thieme Medical Publishers, New York.*
4. *Vasudevan DM(1995): Textbook of Biochemistry for medical student's first edition: Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.*
5. *Vasudev DM(2013): Textbook of Biochemistry for medical student's seventh edition Jaypee Medical Publishers Pvt Ltd, New Delhi.*
6. *Sood R (1999) fifth edition: Medical Laboratory Technology, Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.*
7. *Sood R(1985) first edition: Medical Laboratory Technology, Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.*

REFERENCE BOOKS FOR PRACTICALS:

8. *Mukherjee KL (1988) Volume II:Medical Laboratory Technology,Tata McGraw-Hll Publishing Company Ltd. New Delhi.*
9. *Kamat G(2011). Practical manual of Hematology. Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.*

CORE COURSE: CLINICAL MICROBIOLOGY (GENERAL AND SYSTEMATIC)	
COURSE CODE:	**PGD-CGMLT-C3**
MARKS:	100 [50 – Theory : 50 – Practical]
CREDITS:	04 [03 – Theory : 01 – Practical]
CONTACT HOURS	THEORY : 45 HOURS (03 LEC/WEEK) PRACTICALS : 30 HOURS (01 PRACTICAL / WEEK)
COURSE OBJECTIVES:	• Hands on training on preparation of culture medias for isolation of bacterias from blood or body fluid samples provided. • To be aware of diagnostic features of bacteria for reporting the correct results observed after analyses using definite proceddures • Learning about the advanced techniques used in recent time to obtain better and faster results to provide immediate treatment.
COURSE OUTCOME	On completion of the course the student should be able to: CO 1: Explain the basis of bacterial culture and identification. CO2: Correlate the microbial techniques with clinical conditions in humans. CO 3: Perform various staining techniques and tests for microbial analysis CO4: Process body samples to detect pathogenic bacteria.

PGD-CGMLT-C3: CLINICAL MICROBIOLOGY (GENERAL AND SYSTEMATIC)		
MODULE	**TOPICS**	**CONTACT HOURS**
Module 1: Introduction to microbiology	• Historical prospective, 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 preparation, adjustment of pH, sterilization.	15
Module 2: Serology	• Serology: Antigen, antibody, antigen-antibody reaction. • Newer methods of diagnosis: PCR, Bactec, Flow cytometry.	15
Module 3: Systemic (Individual Bacteria)	• Systemic (Individual Bacteria): Diagnosis features (morphology, cultured characters, biochemical reaction,, antigenic characters, pathogenicity and laboratory diagnosis) of Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Corynebacteria, Clostridia, Escherichia coli, Klebsiella species, Salmonella, Shigella, Proteus, Pseudomonas, Mycobacterium tuberculosis, Treponema pallidum.	15

PRACTICAL COMPONENT OF PGD-CGMLT-C3:CLINICAL MICROBIOLOGY(General and Systematic) [DURATION – 02 HRS/WEEK]	
Practical	**No. of Practicals**
Introduction to microbiology 1. Preparation of smears for staining and fixation from samples and culture media (both liquid and solid media). 2. Care and use of microscopes (including Fluorescent microscope). 3. Staining techniques: (Gram staining, zeihl nelson, Fluorescent method): preparation of satins, procedure, reporting of smears, principle involved (02 Practicals). 4. Equipments used in sterilization: Description (structure), working principle involved, articles sterilized, advantages and disadvantages. **Serology** (any 03) 5. Widal, VDRL, RPR, ELISA, PCR, Flow cytometry. **Systemic (Individual Bacteria)** 6. Culture media: types, constituents of each media, method of preparation, adjustment of pH, sterilization, uses. (02 Practicals). 7. Culture techniques: different methods of inoculation from clinical samples and bacterial growth from media. (02 Practicals). 8. Preparation of wet mount and motility of organisms. 9. Sputum examination: Physical examination, wet preparation, smear examination, concentration techniques for mycobacteria. 10. Systemic bacteriology: Practical demonstration of diagnostic features of i. Gram positive organisms. ii. Gram negative organisms. iii. Anaerobes, spirochetes. iv. Mycobacteria.	15

REFERENCE BOOKS:

1. *Wilson J(2000). Clinical Microbiology. Eighth edition, Elsevier Publication. Bailièrre Tindall imprint.*
2. *Willey JL(2017).Prescott's Microbiology. 10 edition. McGraw-Hill Education / Europe, Middle East & Africa;*
3. *FirkinF (1958) Clinical Haematology: Blackwell publishings, Wiley India*
4. *Ramnik Sood (1985) first edition: Medical Laboratory Technology, Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.*
5. *Vasudev DM(2013): Textbook of Biochemistry for medical student's seventh edition Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.*
6. *Sood R (1985) first edition: Medical Laboratory Technology, Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.*

REFERENCE BOOKS FOR PRACTICAL:

7. *Chakraborty P(1995): A text book of microbiology, New Central Book Agency Pvt Ltd, Calcutta.*
8. *Sood R (1985) first edition: Medical Laboratory Technology, Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi*

ELECTIVE COURSE: CLINICAL PATHOLOGY AND HISTOPATHOLOGY	
COURSE CODE:	PGD-CGMLT-E1
MARKS:	100 [50 – Theory : 50 – Practical]
CREDITS:	04 [03 – Theory : 01 – Practical]
CONTACT HOURS	THEORY : 45 HOURS (03 LEC/WEEK) PRACTICALS : 30 HOURS (01 PRACTICAL / WEEK)
COURSE OBJECTIVES:	• Learning techniques of collection of samples such as body fluids and tissues for studying cytological aspect. • Hands on training in learning techniques of processing the tissue samples for further analyses and treatment of particular disease.
COURSE OUTCOME	On completion of the course the student should be able to: CO 1: Describe and demonstrate staining techniques for pathological evaluations. CO2: Explain different techniques used for examining body fluids. CO 3: Process tissue and Perform histopathological techniques CO4: Examine body sample for pathological analysis.

PGD-CGMLT-E1: CLINICAL PATHOLOGY AND HISTOPATHOLOGY		
MODULE	**TOPICS**	**CONTACT HOURS**
Module 1: Histo-pathological techniques	• Fixatives and fixation, clearing, embedding, microtome knives, section cutting, errors, decalcification, frozen section, mounting media, automation. • Staining: Theory of staining, dyes and stains, mordants, differentiation, haematoxylin and eosin staining- principles and procedures, special stains P.A.S., Verhoff's, Massons trichrome, Von Giessons, fat stains and other stains.	15
Module 2: Examination of body fluids	• Sample collection, physical and chemical tests, principles and methods, reagent strip method, microscopic examination-crystals, casts, sediments, pregnancy tests. • Stool examination, semen analysis, sputum examination.	15
Module 3: Cytological techniques	• 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.	15

PRACTICAL COMPONENT OF PGD-CGMLT-E1: CLINICAL PATHOLOGY AND HISTOPATHOLOGY [DURATION – 02 HRS/WEEK]	
Practical	**No. of Practicals**
Histo-pathological techniques: 1. Histopathological techniques: fixation, dehydration, clearing, impregnation, embedding, decalcification. 2. Microtomes knives and their sharpening, section cutting, errors in section cutting, frozen sectioning, mounting media. 3. Routine staining techniques: routine staining, hematoxylin and eosin (H &E) staining. 4. Special staining demonstration: P.A.S., Verhoeff's, Massons trichrome, Von Giessons, fat stains and other stains.	04
5. Grossing and Museum techniques. **Examination of body fluids:** 6. Examination of urine: Physical and chemical. 7. Examination of urine: multiple reagent strips methods, microscopic. 8. Pregnancy tests. 9. C.S.F. examination 10. Examination of body cavity fluids: pleural, peritoneal and synovial. 11. Sputum examination 12. Stool examination 13. Semen analysis.	04
Cytological techniques: 14. Exfoliative cytology: principles, Papanicolauo staining procedure. 15. Fine needle aspiration cytology (F.N.A.C): hematoxylin and eosin (H &E), MGG staining.	02

REFERENCE BOOKS:

1. *Kawthalkar SM(2018). Essential of Clinical Pathology. Second Edition. Jaypee Medical publishers, New Delhi.*
2. *Vasudev DM(2013): Textbook of Biochemistry for medical student's seventh edition Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.*
3. *Sood R(1985) first edition: Medical Laboratory Technology, Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.*
4. *Chakraborty P(1995): A text book of microbiology, New Central Book Agency Pvt Ltd, Calcutta.*
5. *Dereck AC and Cameron IR(2012). Histopathology Specimens: Clinical, Pathological and Laboratory Aspects. Springer publication.*

REFERENCE BOOKS FOR PRACTICAL:

6. *Mohan H(2017).Practical pathology. Jaypee Medical publishers, New Delhi.*
7. *Mukherjee KL (1988) Volume II:Medical Laboratory Technology,Tata McGraw-Hll Publishing Company Ltd. New Delhi.*
8. *Chatterjee MN (2013): Textbook of Medical Biochemistry eight edition: Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.*

ELECTIVE COURSE: ANALYTICAL TECHNIQUES	
COURSE CODE:	PGD-CGMLT-E2
MARKS:	Theory : 100
CREDITS:	04
CONTACT HOURS	THEORY : SWAYAM Course (15 Wks)
COURSE OBJECTIVES:	This course deals with various techniques their principles, experimental details etc., including general Laboratory techniques, separation techniques based on hydrodynamic properties, centrifugation (sub-cellular fractionation etc), and Chromatographic, and Electrophoretic techniques , HPLC, Purification methods, ELISA etc. Application in biomedical research and some clinical diagnostic methods RIA, ELISA, PET etc., Molecular diagnostics ,PCR, etc., Microscopic techniques and clinical biochemistry
COURSE OUTCOME	On completion of the course the student should be able to: CO 1: Discuss and explain the cell techniques and their principles . CO2: Explain the cytological techniques used in biomedical research. CO 3: Compare and contrast molecular diagnostic techniques. CO4: Describe Microscopic techniques and clinical biochemistry procedures.

ELECTIVE COURSE: PGD-CGMLT-E2: ANALYTICAL TECHNIQUES

By Dr. MOGANTY R. RAJESWARI | All India Institute of Medical Sciences, New Delhi-110029

The analytical techniques routinely used in Biochemistry take a very important place in Biochemistry, learning them is not just a requirement but, absolutely essential. This is because, the understanding of the subject mainly comes from the strong basis of the experiments and techniques on which the theories are built.

COURSE LAYOUT

- Week 1
  Aqueous solutions , Acids, Bases, buffers systems and pH meter, Colorimetry and UV-VIS absorption spectroscopy Introduction to Hydrodynamic Techniques
- Week 2
  Centrifugation: Principles & Methodology Density Gradient centrifugation : Rate Zonal and isopycnic Differential centrifugation for Sub-cellular Fractionation
- Week 3
  Gel filtration: Principle, Methodology & Applications Planar Chromatography: Principles and Applications
- Week 4
  Ion-exchange chromatography, Affinity chromatography
- Week 5
  Gas chromatography, HPLC, Protein Estimation Techniques
- Week 6
  Electron Microscopy, TEM and SEM Fluorescence Microscopy : Application to live cell imaging
- Week 7
  IHC and IF, Flow cytometry: Theory and concept Flow cytometry:Application in biology

and medicine

- Week 8
  Light Microscopy and Confocal Microscopy, SDS-PAGE
- Week 9
  Western Blotting Techniques, 2D Electrophoresis and DIGE, Principles of Mass spectrometry
- Week 10
  Clinical Proteomics Methods to quantify and Integrity check of DNA
- Week 11
  Methods to quantify and Integrity check of RNA, PCR and Real Time PCR, Blotting techniques for Nucleic acids
- Week 12
  Sequencing techniques of nucleic acids, Introduction to Recombinant DNA Technology
- Week 13
  Expression techniques of recombinant proteins using Bacteria and yeast, Expression techniques of recombinnat proteins by insects and mammalian cells, Introduction to Genomic Techniques
- Week 14
  Techniques for studying Nucleic acid,Protein interactions, ELISA, RIA :Diagnostic applications
- Week 15
  CLIA and its Diagnostic application, PET and its Diagnostic applications, Single cell Biology.

REFERENCE BOOKS:

1. Ghosal S and Sharma AA(2018). Fundamentals of Bioanalytical techniques and instrumentation. Second edition. PHI Learning Pvt Ltd. New delhi.
2. Ternynck T and S. Avrameas S(1990). Immunoenzymatic Techniques (Techniques in Immunology) . INSERM publication

ELECTIVE COURSE: ESSENTIALS OF BIOMOLECULES: NUCLEIC ACIDS AND PEPTIDES	
COURSE CODE:	PGD-CGMLT-E3
MARKS:	Theory : 100
CREDITS:	04
CONTACT HOURS	SWAYAM Course of 12 weeks
COURSE OBJECTIVES:	To provide essentials of chemistry and biology of two very important classes of biomolecules: nucleic acids (DNA/RNA) and proteins.
COURSE OUTCOME	On completion of the course the student should be able to: CO 1: Explain how structural features are translated into biological functions CO2: Describe the process of DNA replication CO 3: Mechanism of step-wise synthesis of specific sequence of proteins; CO4: Know the application of recent molecular techniques used for disease detection

ELECTIVE COURSES PGD-CGMLT-E3: ESSENTIALS OF BIOMOLECULES: NUCLEIC ACIDS AND PEPTIDES

By Prof. Lal Mohan Kundu | IIT Guwahati

The proposed course aims to provide essentials of chemistry and biology of two very important class of biomolecules: nucleic acids (DNA/RNA) and proteins. The course allows to decipher: how structural features are translated into biological functions; how highly organized and selective chemical reactions are adopted that allows DNA to replicate or dictates step-wise synthesis of specific sequence of proteins; how organic chemistry tools in combination with enzymes were ingeniously applied to determine sequences of DNA and proteins and how chemical modifications could be done to mimic similar biological properties. The course also includes modern techniques, development of biomolecular probes as high-throughput detection of biomolecules, single nucleotide polymorphisms and disease diagnosis. Overall, the course falls within the domain of organic chemistry and chemical biology.

COURSE LAYOUT

Week 1: Introduction, Nucleic acids and proteins
Week 2: Synthesis of nucleobases, nucleotides and oligonucleotides
Week 3: Solid phase synthesis of oligonucleotides
Week 4: DNA replication, Polymerases, DNA sequencing and PCR
Week 5: DNA damage, mutations and cancer
Week 6: DNA to proteins: transcription, translation and genetic code
Week 7: Peptides, sequencing and applications in therapeutics
Week 8: Solution phase and solid phase peptide synthesis
Week 9: Expansion of genetic code: PNA, LNA and molecular probes
Week 10: Modern techniques for biomolecules and disease diagnosis
Week 11: Structures and chemistry of sugars and carbohydrates
Week 12: Carbohydrate based polymers as biomolecular probes and therapeutics; conclusion

BOOKS AND REFERENCES

1. Essentials of Chemical Biology by A. Miller and J. Tanner
2. Biochemistry by Berg,Tymoczkao and Stryer
3. Molecular Biology of The Cell by Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter
4. Molecular Biology of The Gene by James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine, Richard Losic

COURSE SYLLABUS: SEMESTER II
(02 Core + 2 Elective course + Internship)

CORE COURSE: CLINICAL GENETICS II	
COURSE CODE:	PGD-CGMLT-C4
MARKS:	100 [50 – Theory : 50 – Practical]
CREDITS:	04 [03 – Theory : 01 – Practical]
CONTACT HOURS	THEORY : 45 HOURS (03 LEC/WEEK) PRACTICALS : 30 HOURS (01 PRACTICAL / WEEK)
COURSE OBJECTIVES:	• To get acquainted with recent procedures used in artificial reproductive techniques and their acceptance in the society. • Techniques for analysis of samples for success of procedures conducted • Knowledge of recent techniques used for better results and treatment • To learn about genetic counseling and steps to help guide patient for particular medical treatment available.
COURSE OUTCOME	On completion of the course the student should be able to: CO 1: Describe and explain the molecular genetic techniques used in genetic diagnosis and reproductive techniques which can be recommended to overcome infertility. CO2: Demonstrate the application of dermatoglyphic prints in disease detection. CO 3: Perform procedures of DNA isolation, Molecular size determination, and disease detection for inborn errors of metabolism. CO4: Analyze FISH images and DNA fingerprints.

PGD-CGMLT-C4: CLINICAL GENETICS II		
MODULE	**TOPICS**	**CONTACT HOURS**
Module 1: Molecular genetic, 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
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)	15

	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

PRACTICAL COMPONENT OF PGD-CGMLT-C4: CLINICAL GENETICS II [DURATION – 02 HRS/WEEK]	
Practical	**No. of Practicals**
Molecular genetics, Genetics of Cancer, Dermatoglyphics : 1. Introduction to molecular genetic lab: general rules, handling of chemicals, equipments and biological materials; waste disposal. 2. Isolation of DNA from human blood. 3. Determination of molecular size of DNA. 4. Analysis of DNA fingerprints and FISH images (02 Practicals) 5. Dermatoglyphics: Recording of print of fingertips and palm. (02 Practicals) **Reproductive technologies, Genetics and Society** : 6. Manual DNA sequencing and data analysis. **Prenatal Diagnosis, Genetic Counselling** : 7. Amniotic fluid culture: Flask method and Cover slip method. 8. Chorionic villi culture: Short term culture 9. Chromosomal analysis from product of conception (abortus study) (03 Practicals) 10. Disease suspection by spot tests: Fanconis syndrome, PKU, maple syrup urine disease, Tryptophanuria(02 Practicals)	15

REFERENCE BOOKS:

1. *Jorde L, Carey J and Bamshad M(2016). Medical Genetics. Fifth edition. Elsevier Publication imprint. eBook ISBN: 9780323391979.*
2. *Singh BD (2014): Fundamentals of Genetics. Second Edition, Kalyani Publishers, New Delhi.*
3. *Matheiesen A and Roy K(2018). Foundation of Perinatal Genetic counseling. eISBN: 9780190681111*
4. *Gardner EJ, Simmons MJ and Snustad DP (2013): Principles of Genetics, Eighth Edition, John Wiley Publication, Singapore*
5. *De Robertis EDP, De Robertis EMF (2012): Cell and Molecular Biology, Eigth Edition. Wolter Kluwer Publication, Philadelphia.*
6. *Thompson JS, Thompson MW(1966): Thompson & Thompson Genetics in Medicine ,Elsevier Publication, Philadelphia.*

REFERENCE BOOKS FOR PRACTICALS:

7. *Arumuga N, MeyyanRP(2016): Advances in Genetics Volume 1(Dr. N. Arumugam, R P Meyyan, Saras Publication, Nagercoil, Tamil Nadu.*
8. *GardnerA and Davies T(2010) Human Genetics 2nd Edition,Viva books publication,Delhi.*

CORE COURSE: CLINICAL BIOCHEMISTRY II	
COURSE CODE:	PGD-CGMLT-C5
MARKS:	100 [50 – Theory : 50 – Practical]
CREDITS:	04 [03 – Theory : 01 – Practical]
CONTACT HOURS	THEORY : 45 HOURS (03 LEC/WEEK) PRACTICALS : 30 HOURS (01 PRACTICAL / WEEK)
COURSE OBJECTIVES:	• Testing, observing and analyzing blood function test • Knowledge about the Clinical aspects and use of it during performance of test.
COURSE OUTCOME	On completion of the course the student should be able to: CO 1: Understand and explain clinical significance of metabolism of biomolecules. CO2: Explain the significance of function tests of body systems \. CO 3: Perform Chemical examination of body fluids. CO4: Conduct Liver, Thyroid and Kidney function tests.

PGD-CGMLT-C5: CLINICAL BIOCHEMISTRY II		
MODULE	**TOPICS**	**CONTACT HOURS**
Module 1: Carbohydrate, Protein, Lipid Metabolism	• Carbohydrate metabolism: Clinical aspects of Regulation of Blood sugar and Diabetes • Protein metabolism: starvation, and protein energy malnutrition • Lipid metabolism : Clinical aspects of lipid profile, artherosclerosis.	15
Module 2: Function Tests 1	• Gastric function tests. • Pancreatic function tests. • Cardiac function test	15
Module 3: Function Tests 2	• Liver function tests. • Thyroid function tests. • Kidney function test	15

PRACTICAL COMPONENT OF PGD-CGMLT-C5: CLINICAL BIOCHEMISTRY II [DURATION – 02 HRS/WEEK]	
Practical	**No. of Practicals**
Carbohydrate, Protein, Lipid Metabolism : 1. Chemistry of saliva. 2. Chemistry of gastric juices 3. Estimation of glucose in blood. GTT and its interpretation 4. Normal urine 5. Full urine report (02 Practicals) 6. Serum lipid profile **Study of Function Tests** : 7. Estimation of bilurubin. 8. Estimation of serum proteins. 9. Estimation of blood urea. 10. Estimation of creatinine in blood. 11. Estimation of uric acid in blood. 12. Clearance tests – Demonstration 13. Demonstration of liver function/ cardiac function / kidney function tests. 14. C.S.F. examination.	15

REFERENCE BOOKS:

1. *Lieberman MA and Ricer R(2019). BRS Biochemistry, Molecular Biology, and Genetics.Wolter Kulver Publication.*
2. *Nelson DL and Cox MM(2019). LehningerPrinciples of Biochemistry, Seventh edition. Wiki publications.*
3. *Panini RS(2013).Medical biochemistry – an illustrated review. Thieme Medical Publishers, New York.*
4. *Vasudevan DM(1995): Textbook of Biochemistry for medical student's first edition: Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.*
5. *Vasudev DM(2013): Textbook of Biochemistry for medical student's seventh edition Jaypee Medical Publishers Pvt Ltd, New Delhi.*
6. *Sood R (1999) fifth edition: Medical Laboratory Technology, Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.*
7. *Chatterjee MN (2013): Textbook of Medical Biochemistry eight edition: Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.*

REFERENCE BOOKS FOR PRACTICALS:

8. *Mukherjee KL (1988) Volume II:Medical Laboratory Technology,Tata McGraw-Hll Publishing Company Ltd. New Delhi.*
9. *Kamat G(2011). Practical manual of Hematology. Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.*

ELECTIVE COURSE: CLINICAL PARASITOLOGY, MYCOLOGY AND VIROLOGY	
COURSE CODE:	PGD-CGMLT-E4
MARKS:	100 [50 – Theory : 50 – Practical]
CREDITS:	04 [03 – Theory : 01 – Practical]
CONTACT HOURS	THEORY : 45 HOURS (03 LEC/WEEK) PRACTICALS : 30 HOURS (01 PRACTICAL / WEEK)
COURSE OBJECTIVES:	• Learning about the parasitological, mycological and virological aspects, their life cycle and understanding clinical aspects about the same for analyses and treatment. • Awareness of virus spread and tests performed for the same for their analyses
COURSE OUTCOME	On completion of the course the student should be able to: CO 1: Describe the pathogenecity and aboratory diagnosis of protozoans, Cestodes and Helminthes. CO2: Know the basis of identification and classification of Fungi and viruses. CO 3: Perform Gross and microscopic observation procedures for detecting endoparasites. CO4:

PGD-CGMLT-E4: CLINICAL PARASITOLOGY, MYCOLOGY AND VIROLOGY		
MODULE	**TOPICS**	**CONTACT HOURS**
Module 1: Parasitology	• 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*	15
Module 2: Mycology	• Introduction to mycology including classification • Candida albicans and other candida species	15

	• Dermatophytes • Cryptococcus • Oppotunistic fungi (Aspergillus, Pencillium, Mucor) *NB: Serial no: ii-v will be on the basis of morphology, cultural characters, biochemical (if any), antigens, pathogenecity and laboratory diagnosis.*	
Module 3: Virology	• General virology: Definations, classification, properties of viruses, viral replication, cultivation, laboratory diagnosis. • Systemic virology: On the basis of structure, cultivation, pathogenicity, Laboratory diagnosis of the following viruses: i) Bacteriophage ii) Picomaviruses (Polio viruses) iii) Rhabdoviruses (Rbies virus) iv) Arboviruses(Dengue, Chikungunya, JE) v) Influenza virus vi) Hepatitis virus vii) HIV viii) Herpes virus	15

PRACTICAL COMPONENT OF PGD-CGMLT-E4: CLINICAL PARASITOLOGY, MYCOLOGY AND VIROLOGY [DURATION – 02 HRS/WEEK]	
Practical	**No. of Practicals**
Parasitology 1. Stool examination: gross, microscopic, for adult parasite, segment of Taenia, ova, cysts, and larvae of parasite (02 Practicals) 2. Gross and microscopic features *(whenever applicable)* of intestinal/ vaginal protozoa (02 Practicals). 3. Laboratory diagnosis of malaria: demonstration of whole parasite, parasite antigen, enzymes, serology, (04 Practicals) 4. Gross and microscopic features of cestodes: to include adult worms, segment, larvae, eggs. 5. Gross and microscopic features of Helminthes: to include adult worms, eggs, larvae. Mycology 6. Diagnostic features- practical demonstration of gross and microscopic features (wet mount, slide culture) and other tests whenever applicable for following: Candida, Cryptococcus, Dermatophyte, Oppurtunistic fungi. (02 Practicals) Virology 7. General virology: types of symmetry, morphology of virus models, cultivation in embryonated egg 8. Laboratory diagnosis of the following viruses: Poliovirus, Rhabdovirus, HIV, Hepatitis. 9. Bacteriophage—structure using a model.	15

REFERENCE BOOKS:

1. *Procop GW and Koneman EW(2016). Koneman's Color Atlas and Textbook of Diagnostic Microbiology. Seventh Edition. Wolters Kluwer publications.*

2. *Ward KN, Mc Cartney AC and Thakker B(2008). Notes on Medical Microbiology: Including Virology, Mycology and Parasitology. Second edition. Churchill livingstone Publishers.*
3. *Bhushan V, Tao L and Pali V(2005). Microbiology: Virology, Immunology, Parasitology, Mycology. Fourth Edition. "Blackwell Underground Clinical Vignettes publication.*
4. *Swanson TA, Kim SL and Flomin OE(2007).Underground Clinical Vignettes Step 1: Microbiology I: Virology, Immunology, Parasitology, Mycology (Underground Clinical Vignettes Series). Wolters Kluwer publications.*

REFERENCE BOOKS FOR PRACTICAL:

5. *P.Chakraborty (1995): A text book of microbiology, New Central Book Agency Pvt Ltd, Calcutta.*
6. *Kanai L. Mukherjee (1988) Volume III:Medical Laboratory Technology,Tata McGraw-Hll Publishing Company Ltd. New Delhi*.

ELECTIVE COURSE: HEMATOLOGY AND TRANSFUSION MEDICINE	
COURSE CODE:	PGD-CGMLT-E5
MARKS:	100 [50 – Theory : 50 – Practical]
CREDITS:	04 [03 – Theory : 01 – Practical]
CONTACT HOURS	THEORY : 45 HOURS (03 LEC/WEEK) PRACTICALS : 30 HOURS (01 PRACTICAL / WEEK)
COURSE OBJECTIVES:	• To get acquainted to blood collection and analyses of blood. • To learn various components of blood • Understanding importance of blood donation and learn grouping systems.
COURSE OUTCOME	On completion of the course the student should be able to: CO 1: Explain the composition of blood and changes in Hemolytic disorders. CO2: Describe the structure and functions of WBCs and explain the tests associated with detection of Hemolytic disorders. CO 3: Perform various hemocytometric procedures. CO4: Perform various hematological tests for disease detection.

PGD-CGMLT-E5: HEMATOLOGY AND TRANSFUSION MEDICINE		
MODULE	**TOPICS**	**CONTACT HOURS**
Module 1: Hematology – Blood composition and Hemolytic disorders	• 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.	15
Module 2: WBCs and Platelets	• White blood corpuscles: Description, morphology, leucocyte counts, leucopenia, leucocytosis, 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.	15
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.	15

PRACTICAL COMPONENT OF PGD-CGMLT-E5: HEMATOLOGY AND TRANSFUSION MEDICINE [DURATION – 02 HRS/WEEK]	
Practicals	**No. of Practicals**
Hematology : 1. Use and care of microscopes, study of improved neubaur chamber 2. Anticoagulants and blood collection 3. Haemoglobinometry: Sahli's method, Cyanmethemoglobin method. 4. Haemocytometry: Erythrocyte count 5. Haemocytometry: Total WBC count 6. Blood smear preparations: Staining, differential WBC count 7. Peripheral blood smear examination and morphological abnormalities 8. Hemolytic work-up osmotic fragility test, Heinz bodies, sickling, G-6-P-D estimation, Hb-electrophoresis, Hb-F estimation. 9. Reticulocyte count- absolute eosinophil count 10. E.S.R, P.C.V, Blood indices (02 Practicals) 11. Platelet count, BT, CT, CRT 12. Prothrombin time, A.P.P.T, FDP estimation 13. Bone marrow examination- staining of smear, special stains- PAS, Sudan black, Myeloperoxidase **Transfusion medicine:** 14. ABO grouping and Rh typing.	15

REFERENCE BOOKS:

1. *Rao GH, Eastlund T and Jagannath L(2006).Handbook Of Blood Banking & Transfusion Medicine. Jaypee Medical Publishers, New Delhi.*
2. *A.B. Dutta (2006) :Blood Banking and Transfusion, Satish Kumar Jain for CBS Publishers, New Delhi.*
3. *Rudmann SV(2005).Textbook of Blood Banking and Transfusion Medicine. Second Edition. Elsevier Saunders Publication.*
4. *Bharadwaj K(2015). Transfusion Update. Indian Society of Blood Transfusion and Immunohaematology. Jaypee Medical Publishers, New Delhi.*

REFERENCE BOOKS FOR PRACTICAL:

5. *Mukherjee KL (1988) Volume II:Medical Laboratory Technology,Tata McGraw-Hll Publishing Company Ltd. New Delhi.*
6. *Kamat G(2011). Practical manual of Hematology. Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.*

ELECTIVE COURSE: BIOMOLECULES: STRUCTURE, FUNCTION IN HEALTH AND DISEASE	
COURSE CODE:	PGD-CGMLT-E6
MARKS:	Theory : 100
CREDITS:	04
CONTACT HOURS	15 Week SWAYAM Course
COURSE OBJECTIVES:	To give an overview of importance of biomolecules starting from the simplest molecule, water to complex biomolecules.
COURSE OUTCOME	On completion of the course the student should be able to: CO 1: Explain 3D Structure, separation and sequencing of proteins. CO2: Describe and identifying biomarkers using clinical proteomics CO 3: Discuss the detailed structure of genetic material and its interactive role in disease. CO4: understand and explain the cellular function of biomolecules in physiology and pathology.

ELECTIVE COURSE PGD-CGMLT-E6: BIOMOLECULES: STRUCTURE, FUNCTION IN HEALTH AND DISEASE

By Prof. M.R Rajeswari | Department of Biochemistry, All India Institute of Medical Sciences, New Delhi

This course on Biomolecules is one of the basic course for all PG Students of Biological Sciences.

1. Gives an overview of importance of biomolecules starting from the simplest molecule, water.
2. Elaborate the need to study proteins: Their 3D Structure,protein seperation,sequencing etc.
3. To understand the pathology and identifying biomarkers using clinical proteomics.
4. Explain in detail DNA,RNA their structures, interactions role in disease,genomics.epigenetics.
5. Enumerate the role of carbohydrates,lipids and their cellular function in physiology and pathology.
6. To briefly introduce to system biology

COURSE LAYOUT

Week 1

Chemical bonds:Different types of Bonds, Bond energies,Bond Angles etc, Water:The molecule of life,Aqueous Solution,Acids & Bases,Measurements of pH, Henderson Haselbatch equation,Titration Curve & pK values,Buffers

Week 2

Amino acids, chirality, peptide bond and polypeptides,Structural levels of proteins and Stabilizing forces,Conformational properties of polypeptides and Ramachandran plot

Week 3

Turns, loops, Super secondary structures, motifs and domains in proteins,Structures and function of Fibrous Proteins,Structure and function of Actin and myosins

Week 4

Hemoglobin, Myoglobin and Oxygen binding,Role of Protein Structure in Health and Disease,Assessment 1

Week 5

Protein Seperation Techniques: Centrifugation & Chromatography,Protein sequencing

Week 6
Methods of structure determination of proteins : X-ray, NMR, CD etc,Clinical Proteomics

Week 7
Antigen-Antibody Complex and their Applications in Immunology,Protein-Ligand(Small Molecules including drugs) interaction

Week 8
Components of Nucleic Acids,Conformational parameters of Nucleic acids and DNA double helix,DNA Polymorphism

Week 9
Circular DNA,Supercoil DNA

Week 10
Interactions of small molecules (ions, drugs) with DNA,Different types and structures of RNA

Week 11
DNA-Protein interactions,Assessment 2

Week 12
Introduction to Carbohydrates,Structures of polysaccharides,Saturated and unsaturated fatty acids, Nomenclature of fatty acids and Essential and non-essential fatty acids

Week 13
Glycoproteins and Proteoglycons,Classification of Lipids: simple and compound lipids, phospholipids, Cholesterol,Micelles and Liposomes : Applications in biology and medicine

Week 14
Lipids: extraction, separation and analysis,Components and architecture of Cell membrane,Various membrane models including Fluid-mosaic model

Week 15
Cholesterol and its role in health and disease,Interrealtionship of Biomolecules : System Biology,Epigenetics and Human Diseases,Final Assessment

BOOKS AND REFERENCES

1. An Introduction to Biophyics by Moganty R Rajeswari, 2013.
2. Biophysical Chemistry,Part II, Techniques for the study of biological structure and function,by Cantor C.R. and Schimmel P R., W.H. Freeman and Company, 1980.
3. Nucleic Acids in chemistryand Biology,by Blackburn G.M. and gait M.J.,IRL Press,1990.
4. Biochemistry, by Voet D. and Voet J.G., John Wiley and sons, 1995.
5. Physical Biochemistry, by Freifelder D., W.H. Freeman and company, 1976-1982.

ELECTIVE COURSE: IMMUNOLOGY	
COURSE CODE:	PGD-CGMLT-E7
MARKS:	Theory : 100
CREDITS:	04
CONTACT HOURS	12 week SWAYAM Course
COURSE OBJECTIVES:	To supplement and enhance the understanding of students about different dimensions of Immunology starting from defense systems of the body, immunity, antigens, antibodies, hypersensitivity, cytokines, complement system, vaccines and how our body continuously defends us from various pathogens and maintains homeostasis against many environmental challenges.
COURSE OUTCOME	On completion of the course the student should be able to: CO 1: Explain the mechanisms adopted to impart immunity CO2: Describe the Organization and functioning of the immune organs. CO 3: Discuss the Structure and functions of different classes of immunoglobulins CO4: identify and correlate Immunoassays to Immune dysfunctions.

ELECTIVE COURSE PGD-CGMLT-E7: IMMUNOLOGY

By Dr. Manzoor Ahmad Mir | University of Kashmir

The course is specially designed to supplement and enhance the understanding of students about different dimensions of Immunology starting from defense systems of the body, immunity, antigens, antibodies, hypersensitivity, cytokines, complement system, vaccines and how our body continuously defends us from various pathogens and maintains homeostasis against many environmental challenges.

The objectives of this course is to give the target students/audience an understanding of:

- Fundamentals of the immunology and how our body responds to different environmental challenges.
- Early theories of Immunology, Cells , organs and molecules of the Immune system.
- Different types of immunity (innate and adaptive) employed by the immune system to defend us from foreign pathogenic attacks.
- Organization and functioning of the immune organs, cells and molecules like antibodies, cytokines and chemokines.
- Structure and functions of different classes of immunoglobulins, Antigen-antibody interactions
- Immune dysfunctions (Rheumatoid Arthritis and AIDS)
- Immunoassays (ELISA, RIA, immunoblotting and Hybridoma technology) Monoclonal antibodies in therapeutics and diagnosis
- Hypersensitivity and complement system Vaccines and their developmen

COURSE LAYOUT

- WEEK 1
  - Historical Perspective of Immunology
  - Early Theories of Immunology
  - Cells of the Immune System
  - Organs of the Immune System
- WEEK 2
  - Anatomical barriers of Immune system
  - Inflammation
  - Cells and Molecules of Innate Immunity
  - Cell Mediated and Humoral Immunity
- WEEK 3

- Passive and active Immunity (Artificial and Natural)
- Immune Dysfunction (Rheumatoid Arthritis and AIDS)
- HIV-AIDS a Global Health Emergency
- Antigenicity and Immunogenicity

- WEEK 4
  - Immunogens (Factors influencing immunogenicity)
  - Adjuvants and Haptens
  - Types of Antigens
  - B and T-cell Epitopes
- WEEK 5
  - Types of Immunoglobulin's
  - Antigen antibody interactions
  - Immunoassays
  - Hybridoma Technology
- WEEK 6
  - Monoclonal Antibodies in Therapeutics and Diagnostics
  - ELISA, RIA and Immunofluorescence
  - Alexa floure tagging of antibodies and Flow cytometry
  - Structure and function of MHC Molecules
- WEEK 7
  - Endogenous and Exogenous pathways
  - Antigen Presenting cells
  - Antigen processing
  - Antigen presentation
- WEEK 8
  - B Cell and T cell Signalling in antigen presentation
  - Costimulation and reverse costimulation in presentation
  - Cytokines and their types
  - Properties and Functions of cytokines
- WEEK 9
  - Therapeutic cytokines
  - Chemokines and cytokines in infectious diseases
  - Complement System and its components
  - Pathways of Complement system
- WEEK 10
  - Hypersensitivity and Allergy
  - Gell and Coombs classification of Hypersensitivity
  - Aeroallergens and their control
  - Various types of hypersensitivities
- WEEK 11
  - Vaccines and their properties
  - Live Vaccines
  - Attenuated and Heat killed Vaccines
  - DPT, Influenza and Polio vaccines

BOOKS AND REFERENCES

At the End of every module reference materials are given in quadrant 3 INSTRUCTOR BIO

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