**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 212**

**Course Title : Medical Microbiology**

**Credit Hours : 3 + 1 = 4**

**Course Description:**

This is a general medical microbiology course intended for students outside the department of Clinical Laboratory Sciences. The structure of the course is based on presenting the fundamentals of microbiology to include structures, morphology and classification of bacteria, viruses, fungi and parasites. The students will be introduced to the pathogenesis of the various infectious agents. The course will also cover some topics related to community health, including the modes and sources of infections as well as prevention of these infections.

**CLS 212: Lectures Outline**

**Weeks Subjects**

1. General introduction

 Historical Background & classification of microorganisms

2. Introduction to Viruses

 Structure and morphology of viruses

 Classification / Replication / Pathogenicity

3. Introduction to Fungi

 Structure and morphology of fungi

 Classification / Fungal diseases

4. Introduction to Parasites

 Classification /General characteristics of protozoa

 Medically important protozoa

 General characteristics of helminths/Medically important

 helminths

5. Introduction to Bacteria

 Classification / Morphology

 Bacterial Structures / Bacterial replication

6. Bacterial growth / Growth curve

 Factors affecting growth

7. Antimicrobial agents

8. Microbial control / Principles

 Physical and chemical methods

9. Microbial control – Chemical agents

 Hospital acquired infections

10. Pathogenicity of infectious diseases

 Normal microbial flora

11. Upper respiratory tract infections

12. Lower respiratory tract infections

13. Wound and skin infections

14. Sexually transmitted diseases

15. Food borne diseases, Water borne diseases

**CLS 212: Laboratory Schedule**

**Weeks Subjects**

1. Introduction to Microbiology laboratory

 Techniques and safety rules

2. Introduction to light Microscopy

 Types of light microscope

3. Examination of stained smear and wet mounts

4. Microscopic examination of eukaryotic microorganisms

5. Staining of bacterial cells and bacterial

 structures ( simple and differential stains )

6. Bacterial culture media

 Techniques of cultivation

7. Microbial flora of skin and oral cavity

 Environmental sampling

8. Antimicrobial Agents - Methods of sensitivity testing

9. Microbial count : viable and total counts

10. Factors affecting microbial growth

11. Physical and chemical methods used in microbial

 control

12. **Revision**

13. **FINAL PRACTICAL EXAMINATION**

**Assessments:**

First Mid Term Examination: 15

Second Mid Term Examination: 15

Laboratory Quizzes: 5

Mid Term Practical Examination: 5

Final Practical Examination: 20

Final Theoretical Examination: 40

**References:**

1. Cano J. Raoul and Calome J.S., **Microbiology**, West Publishing Company, USA, Latest Edition
2. Eugene W. Nester et al, **Microbiology- A Human Perspective**, Mc Graw Hill, USA,Latest Edition
3. Tortora, G. J., B. R. Funke, and C. L. Case., **Microbiology, An Introduction**, (7th edition) Benjamin Cummings, San Francisco, 2002

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 221**

**Course Title : Basic Anatomy & Physiology**

**Credit Hours : 4 + 0 = 4**

**Course Description:**

To acquaint the student with a comprehensive knowledge about the anatomy and physiology of the human body that help him to build his background information in the basic sciences that will enable him to understand the deviation from the normal in the different specialities that he/she may be directed to later on.

**CLS 221: Lectures Outline**

**Weeks Subjects**

1. Introduction to Anatomy and Physiology:
* Body orientation, planes and sections, surface anatomy, body cavities and terminology, organ systems: an overview
* Body fluids and its distribution, mechanism of transport across the cell membrane, structure of the cell membrane

 2. Cell and Tissues:

* Structure and function of cell
* Cell division
* Body tissue: Epithelial tissue, Connective tissue, Muscle tissue, Nervous tissue

 3. Skin and Body Membrane:

* Basic structure and function of skin
* Appendages
* Classification of body membranes

 4. Skeletal system:

* Functions, bone markings and classification of bones, structures of bones
* Applied aspects

 5. Nervous System:

* Division by the Nervous system
* Nervous tissue – Neuroglia, neurons classification and their microscopic structure physiology – Nerve impulses
* Central Nervous System: Brain- different parts, Meninges and spinal cord, CSF
* Peripheral Nervous System: Cranial and spinal nerves, Important Nerves
* Autonomic Nervous System- Introduction
* Applied aspects

6-7. Cardiovascular System:

* Heart structure, External features

 Chambers, valves, pulmonary and systemic circulation

 Major arteries and veins of the body, special

 circulation

 Physiology: Cardiac cycle and heart sounds

* Conduction system of the heart
* Blood vessels, microscopic anatomy
* Blood pressure, Pulse
* Applied aspects

 8. Respiratory System:

* Nasal cavity, pharynx, larynx, trachea, primary bronchi, lungs
* Physiology – Mechanics of respiratory gases and their transport, regulation of respiration
* Applied aspects

9. Digestive System:

* Organs of alimentary canal, mouth, pharynx, oesophagus, stomach, small and large intestines
* Accessory digestive organs, pancreas, liver and gall bladder, salivary glands and teeth
* Physiology- functions of the digestive system
* Applied aspects

10. Urinary system:

* Kidneys- location and structure of nephrons and urine formation, control of blood composition
* Characteristics of urethras, urinary bladder and urethra
* Micturition

11. Reproductive System:

* Male reproductive system
* Testes- structure and functions, spermatogenesis and testosterone production
* Duct system: Epididymis, Vas deferens
* Accessory glands
* External genitalia

12. Nerve and Muscle Physiology:

* Structure of the nerve, generation of action potential (nerve impulse), conduction of nerve impulse, types of nerves
* Structure, types of muscles, mechanism of muscle conduction, types of muscle contraction and concept of muscle fatigue

13. Blood Physiology:

* Composition of the blood
* Function of the different blood cells and the plasma
* The process of haematopoesis
* The mechanism of haemostasis, clinical aspects (Anaemia, haemophilia, Thrombocytopenia)
* Human blood groups, Blood typing

14. Endocrine Physiology:

* Nature of the hormone
* Name and site of the major endocrine glands
* Function of each gland and mechanisms of regulation of its function
* Abnormalities that result from over or under function of each gland
* Clinical aspects (Diabetes Mellitus)

**Assessments:**

First Mid Term Examination: 30

Second Mid Term Examination: 30

Final Theoretical Examination: 40

**References:**

Elaine N Marieb, ***Essentials of Human Anatomy and Physiology***, 7th Edition**,** Benjamin Cummings

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 222**

**Course Title : Descriptive Histology**

**Credit Hours : 2 + 1 = 3**

**Course Description:**

The overall objective of this course is to prepare the students for the advanced courses in CLS and enables the student to identify microscopically the normal tissues and organs of the human body.

**CLS 222: Lectures Outline**

**Weeks Subjects**

1. Introduction

2-3. Epithelial tissue:

 (definition, features, classification and function)

4. Connective tissue:

 (definition, features, cells and fibers)

 Connective tissue types:

 (loose, dense, reticular, adipose and elastic)

5. Supportive connective tissue

* Cartilage (general features, functions and types: hyaline, elastic, white fibrocartilage)
* Bone (general features, functions, types: spongy, compact and development)

6. Muscular tissue (general features and types)

7. Nervous tissue

* Central nervous system (parts), types and structure of neuron
* Peripheral nervous system: Types and structure of nerves and ganglia
* Nerve endings, Synapse
* Neuroglia

8. Circulatory system

* Blood circulation
* Heart structure and function
* Arteries and veins (types, structure and comparison of both)
* Comparison between capillaries and sinisoids
* Lymph circulatory system: lymph vessels

9. Lymphatic organs

* Lymph nodes: structure and function
* Spleen, thymus, tonsils

10. Respiratory system

* Upper: nose, nasopharynx, larynx
* Lower: trachea, bronchus, bronchiole
* Structure of the lung
* Pleura

11-12. Digestive system

* Oral cavity: lip, tongue (papillae and its function)
* Digestive tube: general structure of esophagus, stomach, small and large intestine, appendix

13. Digestive glands:

 Salivary gland, liver, gall bladder and pancreas

14. Urinary system

 Parts, function and structure of kidney and urinary

 passage (ureter, urinary bladder and urethra in males

 and females)

**CLS 222: Laboratory Schedule**

**Weeks Subjects**

1. Cell structure: electron microscopic study of cellular

 Components (organelle and inclusions)

2. Demonstration of types of epithelium,

3. Demonstration of glands

4. Revision for epithelial tissue

5. Demonstration of cartilage types

6. Demonstration of CT types

7. Demonstration of bone types

8. Demonstration of types of muscles

9. Demonstration of nervous tissue

10. Demonstration of aorta, medium-sized artery and vein

11. Demonstration of Lymph organs

12. Practice on body organs (liver, lung and kidney)

13. **Revision**

14. **FINAL PRACTICAL EXAMINATION**

**Assessments:**

First Mid Term Examination: 15

Second Mid Term Examination: 15

Student activities, sharing, Quiz 10

Final Practical Examination: 20

Final Theoretical Examination: 40

**References:**

1. Zakaria Abdulhamid, **Histology I and II**, Al Shaab Printing Press, Cairo house.
2. Ira R. T. and Charlies F.B., **Introduction to functional Histology**, Harper & Row, Pub, NY, London.

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 223**

**Course Title : General Pathology**

**Credit Hours : 2 + 0 = 2**

**Course Description:**

Upon completion of this course, the students will have the appropriate knowledge about the causes of cellular stress and the general pathologic responses to cellular stress, the circulatory disturbance, the basic immune reactions, the main immunopathologic processes, Disorders of growth and neoplasia.

**CLS 223: Lectures Outline**

**Weeks Subjects**

1. Introduction

* Define pathology
* Define disease, study of disease

2. Etiology

* Predisposing and determining factors
* Pathological anatomy (lesion)
* Manifestation of the disease
* Pathological physiology
* Diagnosis

3. Causes of cell damage (stress)

Cellular response to stress

Degeneration

Necrosis and gangrene

4-5. Inflammation (definition, nomenclature and causes)

Pathogenesis, local vascular changes of acute inflammation

The inflammation exudates, inflammatory cells and chemical mediators and sequelae of acute inflammation

* special types of acute inflammation
* types of chronic inflammation

general effects of inflammation

6. Infection

* factors influencing establishment of infection
* factors influencing the course of infection
* mechanism by which disease is produced: bacterial, viral and opportunistic infections

7. Healing

* wound healing
* factors influencing wound healing
* complications
* healing in special situations e.g. kidney, liver muscle, nervous tissue and bone

8-9. Circulatory Disturbances

* hyperemia
* congestion
* obstruction
	+ causes: thrombosis, embolism
	+ effect of vascular obstruction leading to oedema
* heamorrhage

10-11. Immunology

* specific and non-specific immunity
* immune response, antigen, antibodies, compliment, humoral cell mediated response

Diseases of the immune system

* hypersensitivity reactions
* auto-immune disease, tolerance
* immune deficiency diseases

12. Disturbances of growth

* hyperplasia
* hypertrophy
* atrophy
* dysplasia
* metaplasia

13-14. Neoplasia

* definition and classifications
* general features of benign and malignant tumors
* effects and complication of benign and malignant tumors
* tumor of epithelial, connective, muscular and nervous tissues
* carcinogenesis
* brief discussion on diagnosis of tumors and treatment

**Assessments:**

First Mid Term Examination: 15

Second Mid Term Examination: 15

Laboratory Quizzes: 5

Mid Term Practical Examination: 5

Final Practical Examination: 20

Final Theoretical Examination: 40

**References:**

Emanuel Rubin, **Essential Pathology**, Lippincott Williams&Wilkins, Phiadelphia & London.

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 231**

**Course Title : Clinical Analytical Chemistry**

**Credit Hours : 2 + 1 = 3**

**Course Description:**

The course involves a review of fundamental concepts of volumetric analysis as applied to biological fluids. The theoretical and practical aspects of different types of titri-metric analysis including acid-base, complexometric and precipitation titrations are studied.

**CLS 231: Lectures Outline**

**Weeks Subjects**

1. General introduction

* The analytical process
* Review of fundamental concepts
* Concentration of solutions

2. Expression of analytical results

* Principles of volumetric analysis
* Volumetric calculations

3,4,5. Acid – base Equilibrium

* The pH scale
* Buffers
* Buffers of biological and clinical significance

6,7. Complexometric titrations

* Complex and formation constants
* Chelates
* EDTA
* Indicators and detection of the end point

 8,9. Precipitation titrations

* Vohlard method
* Mohr method
* The adsorption indicator method

10,11. Redox titrations

* Principles of Electrochemical cells
* the Nernst equation
* Iodometry

12. Gravimetric analysis

* Gravimetric factors
* Precipitation and co-precipitation
* Peptisation

13. Introduction to instrumental analysis

* Spectrophotometry
* Chromatography

**CLS 231: Laboratory Schedule**

**Weeks Subjects**

1. Basic laboratory equipment and procedures

 safety rules

2. Standardization of sodium hydroxide and hydrochloric

 acid solutions

3. Determination of bicarbonate in blood

4. Mercurimetric determination of blood and urine

 chloride

5. Determination of blood glucose by a Redox

 titration method

6. Complexometric determination of calcium in milk

7. Determination of the ionization constant of a weak acid

8. Determination of chloride by the Vohlard method

9,10. Gravimetric determination of chloride

11. Basic principles of visible spectrophotometry

12. Revision

13. FINAL LABORATORY EXAMINATION

**Assessments:**

First Mid Term Examination: 15

Second Mid Term Examination: 15

Laboratory Work and Reports: 15

Final Practical Examination: 15

Final Theoretical Examination: 40

**References:**

Daniel C. Harris, **Quantitative Chemical Analysis**, W.H. Freeman & Company; 5th edition (August 1998).

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 232**

**Course Title : Clinical Biochemistry ( I )**

**Credit Hours : 3 + 1 = 4**

**Course Description:**

This course illustrates structures and functions of bimolecules which includes carbohydrates, proteins, lipids, nucleic acids, enzymes and hormones.

In the practical part of this course, students study the detection and quantitative determination of some of these biomolecules.

**CLS 232: Lectures Outline**

**Weeks Subjects**

1. Acids, bases, pH scale, buffer system

2. Chemical bonds

3. Amino acids:

 structure, physical and chemical properties

4. Peptide bonds, proteins:

 types, structure, functions

5. Protein purification

6. Nucleotides and nucleic acids

7. Enzymes

8,9. Carbohydrates

10,11. Fatty acids and lipids

12. Hormones

13. Vitamins

**CLS 232: Laboratory Schedule**

**Weeks Subjects**

1. Laboratory Safety

2. pH meter + colour tests of protein

3. Colour tests of amino acids

4. Estimation of protein:

 Precipitation of proteins, plasma, serum and urine

 protein Electrophoresis and TLC

5. Spectrophotometer + Enzyme kinetics

6. General colour tests of carbohydrates

7. Colour tests of pentoses, hexoses

8. General carbohydrate unknown, identification of

 urinary sugars, paper chromatography

9. Determination of Glucose in blood plasma

10. Determination of acid value and iodine number of a fat

11. Determination of saponification value of fat

12. Determination of blood cholesterol

13. **Revision**

14. **FINAL LABORATORY EXAMINATION**

**Assessments:**

First Mid Term Examination: 15

Second Mid Term Examination: 15

Quizzes: 5

Laboratory Reports: 5

Final Practical Examination: 20

Final Theoretical Examination: 40

**References:**

1. David L. Nelson and Michael M. Cox, **Lehninger Principles of Biochemistry,** W. H. Freeman; 4th edition (April 23, 2004).

1. Pamela C. Champe and Richard A. Harvey, **Lippincott’s illustrated reviews: Biochemistry,** Lippincott Williams & Wilkins; 2 Sub edition, 1994.

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 241**

**Course Title : Haematology**

**Credit Hours : 2 + 2 =4**

**Course Description:**

This course teaches basic and diagnostic haematology with an emphasis on pathology. Normal hematopoiesis is covered in lecture, followed by a review of morphology of peripheral blood and bone marrow in lab and normal & abnormal haemoglobins.

Cell counting techniques; blood film staining and role of iron, vitamin B12 and folate. Anemias are covered through lectures, with morphology slides, and illustrative cases, which emphasizes to laboratory diagnosis.

Normal hemostasis, coagulation disorders, and thrombotic disorders are presented through lectures, case discussions and laboratory unknowns.

Morphology slides and clinical correlations are used to present myeloproliferative - lymphoproliferative disorders and acute leukemias.

An individually assigned case study at the end of the course emphasizes proper evaluation of laboratory data, microscopic analysis, and differential diagnosis of common hematologic disorders.

**CLS 241: Lectures Outline**

**Weeks Subjects**

1. Haemopoiesis: physiology and pathology

 Red cells and platelets

2. Granulocytes, Monocytes reticuloendothelial system

3. Benign disorders of white cells: granulocytes

4. Red cell disorders

5. Haemostasis and Anticoagulation

6. Laboratory assessment

7. Iron: Physiology and deficiency Overload and sideroblastic anaemia

8. Megalohlastic anaemia:Vitamin B1, Folate deficiency

9. Haemolytic anaemias: Genetic defects of haemoglohn

10. Inherited defects of haemogolohin-sickle cell disease

11. Acute leukaemia

12. Chronic lymphocytic leukaemia

13. Myeloproliferative disorders

14. Clinical assessment

**CLS 241: Laboratory Schedule**

**Weeks Subjects**

1. Collection of blood from patients

2. Basic haematological techniques

3. Preparation and staining methods for peripheral blood

 and bone-marrow films

4. Blood-cell morphology in health and disease

5. Blood-cell cytochemistry and supplementary techniques

6. Laboratory methods used in the investigation of the haemolytic anaemias

7. Investigation of the hereditary haemolytic anaemias

8. Investigation of the haemoglobinopathies

9. Laboratory methods used in the investigation of paroxysmal nocturnal haemoglobinuria (PNH)

10. Quantitative assay of coagulation factors

11. Investigation of platelet function

12. Laboratory control of anticoagulant and thrombolytic therapy

13. Investigation of megaloblastic and iron-deficiency anaemias

14. Miscellaneous tests

**Assessments:**

Mid Term Examination: 20

Mid Term Practical Examination: 20

Assignment: 10

Final Practical Examination: 20

Final Theoretical Examination: 30

**References:**

1. Atu Mehta & Victor Hoffbrand, **Haematology at a Glance,** ISBN 10-4051-2666-3
2. Sir John V. Dace & SM Lewwis, **Practical Hematology,** ISBN: 0 443 01981 9
3. Shirish M Kawthalkar, **Essentials of Haematology,** ISBN: 81-8061-633-9
4. Hoffbrand AV, Pettit JE, PAH Moss, **Essentials of Haematology,** 4th ed. 2001, Blackwell Scientific Publications, ISBN 0632051531

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 311**

**Course Title : Basic Microbiology**

**Credit Hours : 3 + 1 = 4**

**Course Description:**

This course provides the students with basic theoretical and practical aspects of various groups of microorganisms to include bacteriology, virology, mycology, and Parasitology as well as basic concepts of immunology and epidemiology. It also introduces the basic concepts of disinfectants, antiseptics, preservatives, Ames test, methods of sterilization, aseptic techniques and general microbial control.

**CLS 311: Lectures Outline**

**Weeks Subjects**

1. General introduction to Microbiology

 Historical background and Classification of

 Microorganisms

2. Introduction to Viruses:

 Classification, morphology and structure, Replication and

 Pathogenicity

3. Introduction to Fungi:

 Classification, morphology and structure, Replication and

 Pathogenicity

4. Introduction to Parasites:

 Classification, General Characteristics of parasites and

 Medically important Parasites

5. Introduction to Bacteria:

 Classification, Morphology and Structures

6. Bacterial Structures

7. Microbial Growth requirements:

 Nutritional requirements, Physical requirements,

 Types of bacteria according to energy production

8. Bacterial Growth:

 Growth curve, Constant and synchronous growth

9. Bacterial Metabolism: Catabolic Pathways and regulation

10. Bacterial Genetics:

Mutation and mutagenic agents ,&Ames test

Gene transfer ,PCR ,& genetic engineering

11. Bacterial Genetics continued ….

12. Microbial Control:

 Principles, Disinfectants, antiseptics, and preservatives

 Physical and chemical methods of sterilization Aseptic

 techniques

13. Microbial control continued…

14. Pathogenicity of Infectious Diseases

15. Normal Microbial flora

**CLS 311: Laboratory Schedule**

**Weeks Subjects**

1. Introduction to Microbiology laboratory techniques and

 safety rules

2. Introduction to Microscopy

 Types of Microscopes.

3. Examination of Stained Smear and Wet

 Preparation.

4. Microscopic examination of Eucaryotic microoganisms .

5. Staining of Bacterial Cells ( simple staining )

6. Staining of Bacterial Cells ( differential staining )

7. Preparation and Types of Culture Media

8. Bacterial Culture Techniques

 Colonial Morphology

9. Bacterial Count ( Total & Viable )

10. Factors Affecting Microbial Growth

11. Physical and chemical methods used in microbial

 control

12. **Revision**

13. **FINAL PRACTICAL EXAMINATION**

**Assessments:**

Mid Term Examination: Written 20

Mid Term Examination: Practical 15

Attendance and Reports: 5

Final Practical Examination: 20

Final Theoretical Examination: 40

**References:**

1. Cossart, P., P. Boquet, S. Normark, and R. Rappuolo. **Cellular Microbiology**. ASM Press, Washington, DC, 2000.
2. Kaufmann, S. H. E., A. Sher and R. Ahmed. **Immunology of Infectious Diseases**. ASM Press, Washington, DC, 2001.
3. Madigan, M. T., Martinko, J. M., and J. Parker. **Brock Biology of Microorganisms**. Prentice Hall, Upper Saddle River, NJ, 1997
4. Mims, C., A. Nash, and J. Stephen. **Mims' Pathogenesis of Infectious Disease**. Academic Press, San Diego, CA. 2001.
5. Prescott,L. M., J. P. Harley, and D. A. Klein. **Microbiology** (3rd edition) Wm. C. Brown Publishers, Dubuque, IA, 1996.
6. Salyers, A. A. and D. D. Whitt. **Bacterial Pathogenesis. A Molecular Approach**. ASM Press, Washington, DC, 1994.
7. Tortora, G. J., B. R. Funke, and C. L. Case. **Microbiology, An Introduction**. (7th edition) Benjamin Cummings, San Francisco, 2002.

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 312**

**Course Title : Clinical Mycology**

**Credit Hours : 2 + 1 = 3**

**Course Description:**

In this course the students will learn about the fungi ( molds and yeasts ) of medical importance and the diseases they cause. The classification, structure physiology, and cultural characteristics of fungi will be discussed. Emphasis in this course will be on the fungal diseases and their clinical presentation, pathogenesis, modes of transmission, laboratory diagnosis, prevention and control.

**CLS 312: Lectures Outline**

**Weeks Subjects**

1. Introduction to Mycology.

Structure and morphology of fungi

2. Fungal classification and taxonomy

3. Superficial mycosis:

Definition, symptoms, epidemiology, etiology, laboratory diagnosis and treatment

4. Dermatophytosis :

Definition, symptoms, epidemiology, etiology, laboratory diagnosis and treatment

5. Mycetoma:

Definition, symptoms, epidemiology, etiology, laboratory diagnosis and treatment

6. Chromoblastomycosis, Phaeohyphomycosis,

 Sporotrichosis:

Definition, symptoms, epidemiology, etiology, laboratory diagnosis and treatment

7. Zygomycosis:

Definition, symptoms, epidemiology, etiology, laboratory diagnosis and treatment

8. Lobomycosis, Rhinosporidiosis:

Definition, symptoms, epidemiology, etiology, laboratory diagnosis and treatment

9. Aspergillosis:

Definition, symptoms, epidemiology, etiology, laboratory diagnosis and treatment

10. Candidiasis:

Definition, symptoms, epidemiology, etiology, laboratory diagnosis and treatment

11. Cryptococcosis:

Definition, symptoms, epidemiology, etiology, laboratory diagnosis and treatment

12. Trichosporonosis, Geotrichosis Pneumocystosis:

Definition, symptoms, epidemiology, etiology, laboratory diagnosis and treatment

13. Primary Systemic Fungal Infection: Blastomycosis, Histoplasmosis -

Definition, symptoms, epidemiology, etiology, laboratory diagnosis and treatment

14. Primary Systemic Fungal Infection Coccidioidomycosis, and paracoccidioidomycosis -

Definition, symptoms, epidemiology, etiology, laboratory diagnosis and treatment

**CLS 312: Laboratory Schedule**

**Weeks Subjects**

1. Introduction to Mycology / Safety rules

 Micrometry

2. Preparation of culture media and mountants commonly

 used in Mycology

3. Saprophytic fungi: Examination of cultural morphology

 LPCB prepared slides

4. Techniques of Slide culture, LPCB – Teased mount,

 and Double stick scotch Tape. Subculturing technique

 of Molds from exposed and inoculated plates

5. Slide culture / subculture continued… Identification of

 fungi

 Superficial mycosis: Pityriasis versicolor, Tinea nigra,

 black and white piedra.

6. Dermatophytosis: Microscopic examination of skin, hair

 and nail. Microscopic examination of LPCB prepared

 slides of the dermatophytes ( Trichophyton,

 Microsporum, and Epidermophyton)

7. Subcutaneous mycosis: Examination of culture and

 microscopic morphology of the fungi involved in s

 subcutaneous mycosis. Microscopic examination of

 Mycetoma grains and etiologies

8. Systemic mycosis: Examination of prepared slides

9. Candidiasis: Culturing and identifying yeasts

10. Yeasts identification continued …

 Specimens collection, transport and processing in

 Mycology

11. Serological diagnosis of fungal infections: Latex

 agglutination, Immuno Diffusion, and Counter

 Immunoelectrophoresis

12. **Revision**

13. **Final Practical Examination**

**Assessments:**

Mid Term Examination: 15

Continuous evaluation 5

Laboratory Notebook: 10

Final Practical Examination: 30

Final Theoretical Examination: 40

**References:**

1. Al Hedaithy, Saleh S.A., **Medical Mycology Lecture Slides**, Medical Book House – Riyadh 2006
2. Kwon – Chung et al., **Medical Mycology**, Lea & Fabiger - Philadelphia 1992
3. Larone D., **Medically Important Fungi, A Guide to Identification**, American Society for Microbiology – Washington DC 2002

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 321**

**Course Title : General Pathology**

**Credit Hours : 2 + 1 = 3**

**Course Description:**

Upon completion of this course, the students will have the appropriate knowledge about the causes of cellular stress and the general pathologic responses to cellular stress, the circulatory disturbance, the basic immune reactions, the main immunopathologic processes, Disorders of growth and neoplasia.

**CLS 321: Lectures Outline**

**Weeks Subjects**

1. Introduction

* Define pathology
* Define disease, study of disease

2. Etiology

* Predisposing and determining factors
* Pathological anatomy (lesion)
* Manifestation of the disease
* Pathological physiology
* Diagnosis

3. Causes of cell damage (stress)

Cellular response to stress

Degeneration

Necrosis and gangrene

4-5. Inflammation (definition, nomenclature and causes)

Pathogenesis, local vascular changes of acute inflammation

The inflammation exudates, inflammatory cells and chemical mediators and sequelae of acute inflammation

* special types of acute inflammation
* types of chronic inflammation

general effects of inflammation

6. Infection

* factors influencing establishment of infection
* factors influencing the course of infection
* mechanism by which disease is produced: bacterial, viral and opportunistic infections

7. Healing

* wound healing
* factors influencing wound healing
* complications
* healing in special situations e.g. kidney, liver muscle, nervous tissue and bone

8-9. Circulatory Disturbances

* hyperemia
* congestion
* obstruction
	+ causes: thrombosis, embolism
	+ effect of vascular obstruction leading to oedema
* heamorrhage

10-11. Immunology

* specific and non-specific immunity
* immune response, antigen, antibodies, compliment, humoral cell mediated response

Diseases of the immune system

* hypersensitivity reactions
* auto-immune disease, tolerance
* immune deficiency diseases

12. Disturbances of growth

* hyperplasia
* hypertrophy
* atrophy
* dysplasia
* metaplasia

13-14. Neoplasia

* definition and classifications
* general features of benign and malignant tumors
* effects and complication of benign and malignant tumors
* tumor of epithelial, connective, muscular and nervous tissues
* carcinogenesis
* brief discussion on diagnosis of tumors and treatment

**CLS 321: Laboratory Schedule**

**Weeks Subjects**

1. Disturbances of growth (projector slides)

- Atrophy, hypertrophy, hyperplasia,….

2-3. Degeneration

 - cloudy swelling of kidney

 - normal and fatty liver

 - liver fatty degeneration

 - liver and kidney amyloid degeneration

 - Spleen hyaline degeneration

 - Gangrene

4-5. Chronic and Acute Inflammation

* acute appendicitis
* brain abscess
* fibrinous pericarditis
* Granuloma
* pulmonary Tb
* bilharzias

6. Healing + Granulation + Myocardial scaring

7. Circulatory Disturbances

* chronic venous congestion of the liver
* lung congestion
* infarction (lung and kidney)

8. Circulatory Disturbances

 Aneurism, Thrombosis, Vegetation, Atherosclerosis

9-10. Benign Tumor

* Breast, digestive system, neurofibroma
* Fibrous tissue: fibroma, fibromyoma, lipoma and papilloma

11-12. Malignant Tumor

 Digestive, intestinal and lymph node

13. **REVESION**

14. **FINAL PRACTICAL EXAM**

**Assessments:**

First Mid Term Examination: 15

Second Mid Term Examination: 15

Laboratory Quizzes: 5

Mid Term Practical Examination: 5

Final Practical Examination: 20

Final Theoretical Examination: 40

**References:**

Emanuel Rubin, **Essential Pathology**, Lippincott Williams&Wilkins, Phiadelphia & London

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 322**

**Course Title : Histological Techniques**

**Credit Hours : 1 + 1 = 2**

**Course Description:**

This course will provide the student with the basic knowledge in the techniques of tissue preparation, staining and examination under the light microscope. Knowledge will be focused mainly on the paraffin technique; however, other histological methods will be covered. Also, the student will be instructed how to use the light microscope properly. An idea about other types of microscope will be provided.

**CLS 322: Lectures Outline**

**Weeks Subjects**

1. Introduction to Microtechniques

Lab tools, rules & safety

2. Different histological methods (paraffin, celloidin, cryostat)

Fresh unfixed tissue; teased, squashed, smear, impression, frozen techniques

Tissue processing (manual, automated)

3. Upon obtaining the specimen

Narcotization

Steps of tissue preparation

4. Fixation (purpose, effects, methods, types)

5. Dehydration and clearing

6. Infiltration and embedding

Types of wax, other embedding media

7. Sectioning: 1) Microtome, Types, components,

 techniques, and care

 2) Microtome knife; types, sharpening

3) Sectioning

Affixation and mounting

8. Staining: Definitions

Theory, mechanism, Types,

9. Principle of light microscope,

Theory of magnification & resolution

Components, Definitions

10. Dark field microscope,

Fluorescent microscope

11. Polarized microscope

Phase contrast microscope

12. Discussion

13. Revision

**CLS 322: Laboratory Schedule**

**Weeks Subjects**

1. Lab orientation:

Equipments, machines, rules and principles

2. Preparation of fixatives

Demonstration of cutting, draining and drying

3. Demonstration of staining

Practice cutting, draining and drying

4. Demonstration of automatic processing

Demonstration of Erchlich staining

How to make tissue blocks

5. Demonstration of knife sharpening (honing, stropping)

Tissue mounting

6. Practice on sectioning and mounting

Perls Prussian blue method

7. Further practice on sectioning

8. Haematoxylin, Types, Preparation

9. Connective tissue staining:

PAS, Alcian blue staining

 Van Gisson, Trichrome stain

10. Decalcification

11. Practical methods on microscopy

Micrometry

12. Practice

13. **REVESION**

14. **FINAL PRACTICAL EXAM**

**Assessments:**

First Mid Term Examination 15

Second Mid Term Examination 15

Final Practical Examination 30

Final Written Examination 40

**References:**

J. Bancroft and Alan Stevens, **Theory and Practice in Histological Techniques**, 4th ed., Churchill Livingstone, N Y.

ISBN. 044302006x

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 323**

**Course Title : General Pathophysiology**

**Credit Hours : 2 + 0 = 2**

**Course Description:**

At the completion of this course the student will know the normal structure and functions of the body systems studied. Student should be able to understand the pathophysiology of the most common diseases, its manifestations and the diagnostic methods used.

**CLS 323: Lectures Outline**

**Weeks Subjects**

1,2,3,4. Cardiovascular System

* Physiology and Manifestations
* Congenital Heart Disease, Valvular Disease, Rheumatic disease
* Vascular Disease, Atherosclerosis, Ischemic Heart disease
* Hypertension, Hypotension, Heart Failure

5,6,7,8. Respiratory System

* Physiology and Manifestations
* Pneumonia, Tuberculosis
* Obstructive Disease
* Respiratory Failure

9. Female Genital System

* Physiology and Manifestations
* Causes of Abnormal Uterine Bleeding, Toxemia

10,11,12. Urinary System

* Physiology and Manifestations
* Glomerulonephritis, Causes of Urinary Obstruction
* Renal Failure

13. Digestive System

* Physiology and Manifestations
* Common diseases of the digestive system

14,15. Endocrine System

* Physiology and Manifestations
* Common endocrine diseases

**CLS 323: Laboratory Schedule**

**Weeks Subjects**

1. Explaining clinical cases & its relation to disease process

2. Cardiovascular system:

Technique for measuring blood pressure

3. Clinical cases

Heart failure, congenital heart diseases, myocardial infarction

4. Clinical cases

Rheumatic heart, Atherosclerosis, aneurysm, varicose vein

5. Clinical cases

Respiratory system Upper respiratory airways Lower respiratory airways.

6. Clinical presentation

7. Digestive system (GIT).

8. Digestive system (liver & jaundice

9. Renal disease Clinical cases

10. Endocrine diseases Clinical cases

11. Clinical presentations

12. Clinical presentation

13. **REVISION**

14. **FINAL PRACTICAL EXAM**

**Assessments:**

First Mid Term Examination: 20

Second Mid Term Examination: 20

Final Practical Examination: 20

Final Theoretical Examination: 40

**References:**

1. Carol Mattson and Porth, **Pathophysiology: Concepts of Altered Health States,** J.B. Lippoincott Company, NY, London.

1. Sylvia A. Price and Lorrain M. Wilson, **Pathophysiology: Clinical Concepts of Disease Processes,** Mosby; 6 edition (October 15, 2002).

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 324**

**Course Title : Principles of Electron Microscopy**

**Credit Hours : 3 + 1 = 4**

**Course Description:**

This course will provide the student with the basic knowledge in the theory of magnification and resolution, knowledge about the structure of the electron microscope and its operation, techniques of tissue processing; preparation, and staining. Knowledge will be focused mainly on the avoidance of the artifacts. Students will be informed about some special techniques, scanning electron microscope and dark room.

**CLS 324: Lectures Outline**

**Weeks Subjects**

1. Introduction to electron microscopic unit

Rules & safety and administration

2. Lab orientation, Component of the unit

Unit precautions

Equipments, Lab tools

machines, rules and principles

3. Theory of magnification and resolution

4. Structure of the electron microscope; electron gun, electromagnetic lens, comparison between LM & EM

5. Operation of the EM

6. Processing of a specimen to TEM

 Obtaining a specimen, fixation, dehydration and clearing

7. Infiltration, embedding and sectioning

8. Artifacts, definition, types, avoidance

9. ,chatter, knife marks ..

10. Spécial techniques, perfusion fixation, decalcification

11. Scanning electron microscope, SEM versus TEM

12. Dark room

**CLS 324: Laboratory Schedule**

**Weeks Subjects**

1. Lab orientation:

Equipments, machines, rules and principles

2. Preparation of fixatives, buffers

3. Steps of tissue preparation

4. Obtaining the specimen, fixation

5. Infiltration, embedding and Polymerization

6. Sectioning, Ultramicrotoming

Knife making,

Grid preparation

7. Demonstration of staining, EM viewing

8. Special techniques; coating a grid, perfusion fixation

9. Scanning EM

10. Dark room

11. Demonstration of EM photo

12. Demonstration of EM photo

13. **REVISION**

14. **FINAL PRACTICAL EXAM**

**Assessments:**

First Mid Term Examination: 15

Second Mid Term Examination: 15

Laboratory Quizzes: 10

Final Practical Examination: 20

Final Theoretical Examination: 40

**References:**

1. Sameh E El-shewemi, **Essential Electron Microscopy**, 2nd ed., Al-Riyadh Press, 2004.

 ISBN. 9960-681-00-9

1. A. W. Robards and A. J. Wilson, **Procedures in Electron Microscopy**, Willy Laboratory Pub.

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 331**

**Course Title : Clinical Biochemistry ( II )**

**Credit Hours : 3 + 1 = 4**

**Course Description:**

Course work involves a study of the metabolic activity of animal tissue and its regulation. Major catabolic pathways related to carbohydrate, amino acids, and fatty acids are discussed in detail . the study includes a look at the bioenergetics of cells as well as the digestion and absorption of food material .

**CLS 331: Lectures Outline**

**Weeks Subjects**

1. General introduction

* Metabolic pathways
* Catabolism and Anabolism
* Regulation of metabolic activity

2. Digestion and Absorption

* Photometry
* Role of vitamins in metabolism

3. Bioenergetics

* The role and chemistry of ATP
* Standard free energy change of biochemical reactions

4. Glycolysis

* Regulatory enzymes of glycolysis

5. The citric acid cycle

* Regulation of carbohydrate catabolism

6. The Electron Transport chain & oxidative

 phospharylation

* The energetic value of glucose

7. The pentose phosphate shunt and gluconeogenesis

8. Glycogen metabolism

* The glycogen storage diseases

9. Oxidative degradation of amino acids

* The synthesis of urea

10. Introduction to Inborn Errors of Metabolism

11. Oxidation of fatty acids in animal tissue

* B – oxidation pathway

12,13. Hormones and their metabolic regulatory role

**CLS 331: Laboratory Schedule**

**Weeks Subjects**

1. The hydrolytic activity of salivary amylases on starch

2. Quantitative determination of amylases activity

3. The production of pyruvate and acetaldehyde during the

 fermentation of glucose by yeast

4. Identification of free amino acids by TLC using silica

 gel plates.

5. Quantitative determination of protein by the Biuret and

 Lowry Reactions

6. Enzymatic digestion of fat by pancreatic lipase

7. Effect of Bile salts on pancreatic lipase activity

8. Determination of serum urea by the Berthelot reaction

9. The determination of the phosphorus content of a nucleic

 acid

10. Determination of inorganic phosphate

11. Anthrone Reaction

12. **Revision**

13. **FINAL LABORATORY EXAMINATION**

**Assessments:**

First Mid Term Examination: 15

Second Mid Term Examination: 15

LaboratoryWork and Reports: 15

Final Practical Examination: 15

Final Theoretical Examination: 40

**References:**

1. David L. Nelson and Michael M. Cox, **Lehninger Principles of Biochemistry,** W. H. Freeman; 4th edition (April 23, 2004).

1. [Robert K. Murray](http://www.amazon.com/exec/obidos/search-handle-url/103-7829156-8723856?%5Fencoding=UTF8&search-type=ss&index=books&field-author=Robert%20K.%20Murray), [Daryl K. Granner](http://www.amazon.com/exec/obidos/search-handle-url/103-7829156-8723856?%5Fencoding=UTF8&search-type=ss&index=books&field-author=Daryl%20K.%20Granner), [Peter A. Mayes](http://www.amazon.com/exec/obidos/search-handle-url/103-7829156-8723856?%5Fencoding=UTF8&search-type=ss&index=books&field-author=Peter%20A.%20Mayes), [Victor W. Rodwell](http://www.amazon.com/exec/obidos/search-handle-url/103-7829156-8723856?%5Fencoding=UTF8&search-type=ss&index=books&field-author=Victor%20W.%20Rodwell), **Harper's Biochemistry**; McGraw-Hill Publishing Co; 25th edition (August 28, 1999).
2. J. G. Salway, **Metabolism at a glance**; Blackwell Publishers; 2nd edition (August 15, 1999).

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 332**

**Course Title : Instrumental Analysis**

**Credit Hours : 3 + 1= 4**

**Course Description:**

The knowledge of the principles of instrumentation is essential for a clinical laboratory technologist which can be utilized data. A good understanding of the principles of instrumentation along with the fundamentals of electronics applicable to laboratory instruments is offered in the course. This will prepare the laboratory technologist to adopt analytical procedures to the instruments of the future.

**CLS 332: Lectures Outline**

**Weeks Subjects**

1. Introduction

* Electromagnetic radiation
* Absorption spectroscopy
* Spectrophotometric techniques
* Application of Beer's law
* Visible absorption spectrophotometer,
* Components and applications

2. Atomic absorption spectrophotometer

* Principle, basic components and their function
* Flamless atomic absorption spectrophotometer
* Advantages, interferences

3. Emission spectroscopy

* Luminescence
* Fluorometers
* Fluorometers v/s conventional spectrophotometers
* Instrumentation
* Possible disadvantages, solutions
* Special application of fluorometers

4. Light scattering phenomenon

* Turbidity and nephlometery
* Nephlomter v/s spectrophotometer

5. Flame photometry

* Internal standard in flame photometry
* Advantages/disadvantages

6. Osmometry

* Osmosis, colligative properties
* Osmolality/osmolarity
* Osmometers
* Freezing point osmometers
* Vapor presure osmometers

7. Ion selective electrodes

* Types of electrodes, principle and function
* Reference electrodes
* Glass pH electrodes
* Precipitate electrodes
* Solid state electrodes
* PCO2 and PO electrodes

8. Electrophoretic techniques

* Introduction
* Buffers, support materials
* Endosmosis
* Factors affecting the migration rate
* Clinical applications of electrophoresis

9. Chromatographic techniques

* General principles
* Physical basis of separation
* Adsorption (liquid- solid)

10. Partition (liquid- liquid)

* Gel filtration (steric exclusion)
* Ion exchange chromatography

11. Thin layer chromatography

* High performance liquid chromatography
* Gas chromatography

12. Automated procedures

* Basic concepts, operation, trouble shooting
* Automatic disponsors (dilutors)
* Types of automated equipment
* Continuos flow analyzers
* Discrete analysers

13. Single channel instruments

* Discontinious operation
* (Batch processing, single specimen)
* Multichannel instruments
* Small instruments….six channels
* Large instruments…non discretory, discretory
* Contrifugal analysers

**CLS 332: Laboratory Schedule**

**Weeks Subjects**

1,2. The Visible Absorption Spetrophotometer

3. Basic Concepts of Visible Spectroscopy

4. Fluorometric Determination of Riboflavin

5. Nephlometry and Turbidimetry

6. Measuring of Osmolality using Digital Micro-Osmometer

7. Double-Beam Spectrophotometer

8. Atomic Absorption Specrophotometer

9. Infrared Spectrophotometer

10. ElectroChemistry

**Assessments:**

First Mid Term Examination: 15

Second Mid Term Examination: 15

Laboratory Work and Reports: 15

Final Practical Examination: 15

Final Theoretical Examination: 40

**References:**

1. Daniel C. Harris, **Quantitative Chemical Analysis**, W.H. Freeman & Company; 5th edition (August 1998).
2. Burtis and Ashwood, Saunders, **Teitz Fundamentals of Clinical Chemistry**, 4th edition, 2000

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 333**

**Course Title : Clinical Biochemistry ( III )**

**Credit Hours : 3 + 1 = 4**

**Course Description:**

This is a required course in biochemistry for preparing a generalist in medical technology program. The course will provide a useful application of basic biochemistry along with physiological chemistry in developing an appreciation of the clinical significance of the tests, test methodology and interpretation of test results.

**CLS 333: Lectures Outline**

**Weeks Subjects**

1. Carbohydrates

* Regulation of blood glucose
* Diabetes and hypoglycemia
* Inborn errors leading to hypoglycemia
* Methods of measuring glucose in body fluids
* Considerations in choice of a method
* Glucose concentration in body fluids
* Tolerance tests
* Ketone bodies, clinical significance, tests

2. Amino acids

* A. acids in body fluids.
* Aminoaciduria, primary and secondary
* Neonatal screening, analytical procedures
* Disorders of metabolism, Clinical significance, tests
* Hyperphenylalinimis , Alkaptonuria , maple syrup urine disease

3. Proteins

* General considerations / Hemodilution
* Total serum proteins
* Methods of determination
* Electrophoretic separation of proteins
* Examples of specific changes in separation
* Albumin, clinical significance, method of determination
* Other individual proteins of clinical interest
* Normal values
* Proteins in other body fluids

4. Lipids

* Introduction, analytical and clinical importance
* Lipid transport mechanism
* Lipoproteins, classification
* HDL , LDL , significance
* Cholesterol , triglycerides
* Methods of determination and normal values

5. Liver function

* General considerations, liver pathology
* Bilirubin metabolism
* Liver function alteration during disease
* Liver function test
* Bilrubin determination
* Hepatobiliary enzymes of diagnostic value:

 Alkaline Phosphatases, Transaminases, gama-Glutamyl

 transferases, 5'- nucleotidases

* Other hepatic analytes: Cholesterol, Triglycerides, Serum Proteins, Urea, Ammonia

6. Blood Gases

* Introduction, O2 and CO2 transport
* Partial pressure of O2 and CO2
* Clinical significance
* Methodology, instrumentation

7. Electrolytes

* Clinical relevance in body functions
* Sodium, Potassium, Chloride , Bicarbonate
* Clinical conditions associated with deficiency
* Methods of determination

8. Calcium and Inorganic phosphate

* Physiological importance
* Regulation of Ca / P metabolism
* Methods of determination
* Normal values
* Body disorders with normocalcemia and normophosphatemia

9. Renal function

* Glomerular function , pathology
* Possible approach for renal function
* Evaluation
* Clearance of compounds for estimation of Glomerular filtration rate
* Creatinine, a compound of choice
* Evaluation on the basis of presence of abnormal substances:

 Urea, Creatinine, Uric acid, methods of

 determination

10. Gastrointestinal function

* Gastric function
* Enzymes of GIT tract
* Gastrointestinal hormones: Gastrin, Secretin , other peptides

11,12. Endocrine function tests

* General considerations
* Hormone tests methodology
* Bioassay / modern tests , CPB, RIA , IRMA , EIA , ELISA
* Thyroid hormone synthesis, secretion , metabolism
* T3 , T4 , TSH , free T3 , TBG
* Methods of measurement

13. Ovarian / testicular function tests:

* Biosynthesis of steroid hormones abnormal function, test methods, normal values
* Placental function tests: HPL , Estriol , HCG
* Abnormalities, test methods , norms

**CLS 333: Laboratory Schedule**

**Weeks Subjects**

1. Determination of Glucose in body fluids

2. Determination Total protein

3. Determination of Albumin in serum

4. Determination of Cholesterol in serum

5. Determination Triglycerides in serum

6. Determination of Total & Direct Bilirubin

7. Determination of Transaminases activity in serum

8. Determination of Urea & Creatinine in serum

9. Glucose, BUN and Creatinine analyzers

10. Enzyme immunoassay of T3 hormone

* Competition method
* Sandwich technique
* Immunoradiometric assay (RIA)

11. **Revision**

12. **FINAL PRACTICAL EXAM**

**Assessments:**

First Mid Term Examination: 15

Second Mid Term Examination: 15

Laboratory Work and Reports: 15

Final Practical Examination: 15

Final Theoretical Examination: 40

**References:**

1. Burtis and Ashwood Saunders, **Teitz fundamentals of Clinical Chemistry**, 4th edition, 2000.
2. Alex Kaplan, Williams & Wilkins, **Clinical chemistry: Interpretation and techniques**, 4th edition, 1994.

1. William J Marshall and Stephen K Bangert, **Clinical Biochemistry: Metabolic and clinical aspects,** Churchill Livingstone.

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 411**

**Course Title : Clinical Bacteriology ( I )**

**Credit Hours : 2 + 1 = 3**

**Course Description:**

The first part of this course deals with the theoretical and practical aspects of chemotherapeutic agents, their modes of action, methods of evaluation, susceptibility testing , and mechanisms of microbial resistance.

The second part of the course describes the mechanisms of host parasite relationships, followed by a detailed study of the structure and physiology of Gram positive cocci and Gram negative cocci, the aerobic spore and non-spore forming bacilli, and the Mycobacteria . The diseases caused by these organisms, the clinical presentation, pathogenesis , modes of transmission, laboratory diagnosis, antibiotic susceptibility testing, prevention and control will be fully discussed.

**CLS 411: Lectures Outline**

**Weeks Subjects**

1. Chemotherapeutic agents / Antibiotics – Definition,

 Modes of action, methods of evaluation

2. Antibiotics cont… mechanisms of resistance, Susceptibility testing

3. Staphylococci and Micrococci

4. Streptococci – The Beta haemolytic streptococci

5. Alpha haemolytic Viridans streptococci, &Streptococcus pneumoniae

 Non-haemolytic streptococci (Enterococci)

6. Neisseria , Moraxella, Kingella, Eikenella &Acinetobacter

7. Aerococcus, Peptococcus, Veillionella,and Gemella

8. Corynebacteria

9. Listeria, Erysipelothrix, Lactobacilli, Kurthia

10. Mycobacteria – M. tuberculosis and M. leprae

11. The Atypical Mycobacteria

12. Actinomycetes & Nocardia

13 The aerobic spore bearers – Bacilli

 Bacillus anthracis, Bacillus cereus and other spore forming-bacilli

14. Fastidious gram negative rods:

 Legionella, Francisella ,,Gardnerella, Pasteurella

 and Calymmatobacterium granulomatis

**CLS 411: Laboratory Schedule**

**Weeks Subjects**

1. Antibiotic evaluation : Minimum Inhibitory and Bactericidal Concentration

2. Antibiotic susceptibility testing : Kirby Bauer and

 Stokes’ methods

3. Staphylococci : Culture on different media, identification

 Tests e.g Coagulase,DNase, Novobiocin sensitivity …

4. Beta haemolytic streptococci: Culture and identification

 Bacitracin sensitivity, CAMP test, Lancefield grouping

5. Streptococcus pneumonia &Viridans streptococci :

culture and identification, Optochin sensitivity

 Non haemolytic streptococci (Enterococci):

 Culture and identification

6. Culture and identification of Neisseria, Moraxella and Acinetobacter

7. The Corynebacteria: Culture and identification,

 growth on Tinsdale medium, Elek’s test plate

8. Listeria and Erysipelothrix: Culture and identification

9. Mycobacteria: Fluorescent and ZN stains.

 Culture on LJ and other media

10 Actinomyces and Nocardia

11. The aerobic spore bearers: Culture and identification

 of B.anthracis and B.cereus, and spore stain

12. **REVISION**

13. **Final Practical Examination**

**Assessments:**

Mid Term Examination: 20

Mid Term Practical Examination: 15

Absentees & reports 5

Final Practical Examination: 20

Final Theoretical Examination: 40

**References:**

1. Cossart, P., P. Boquet, S. Normark, and R. Rappuolo. **Cellular Microbiology**. ASM Press, Washington, DC, 2000
2. Vandepitte ,J and Verhaegen J,Engbaek K,Rohner P,Poit P,and C C Heuck. .**BASIC LABORATORY in CLINICAL Bacteriology**.WHO,Geneva,2nd Edition 2003
3. Kaufmann, S. H. E., A. Sher and R. Ahmed. **Immunology of Infectious Diseases**. ASM Press, Washington, DC, 2001
4. Madigan, M. T., Martinko, J. M., and J. Parker. **Brock Biology of Microorganisms**. Prentice Hall, Upper Saddle River, NJ, 1997
5. Mims, C., A. Nash, and J. Stephen. **Mims' Pathogenesis of Infectious Disease**. Academic Press, San Diego, CA. 2001
6. Prescott,L. M., J. P. Harley, and D. A. Klein. **Microbiology** (3rd edition) Wm. C. Brown Publishers, Dubuque, IA, 1996
7. Salyers, A. A. and D. D. Whitt. **Bacterial Pathogenesis. A Molecular Approach**. ASM Press, Washington, DC, 1994
8. Tortora, G. J., B. R. Funke, and C. L. Case. **Microbiology, An Introduction**. (7th edition) Benjamin Cummings, San Francisco, 2002.

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 412**

**Course Title : Medical Parasitology**

**Credit Hours : 3 + 1 = 4**

**Course Description:**

This course deals with the classification, morphological characteristics, life cycles, pathogenicity, epidemiology of parasites, namely:

Protozoa- pathogenic and non-pathogenic amoebae,free living pathogenic amoebae, intestinal and urogenital flagellates, blood and tissue flagellates, ciliates, malarial parasites and other coccidia.

Helminths- Cestodes (pseudophyllidea and cyclophyllidea), Nematodes (intestinal and tissue worms), Trematodes (Intestinal,hepatic and lung flukes).

The clinical presentation of the diseases caused by these parasites will be fully discussed, as well as their transmission, prevention and control, and laboratory diagnosis.

**CLS 412: Lectures Outline**

**Weeks Subjects**

1. Introduction to Parasitology - parasites and parasitism,

 parasitic infections and diseases

 The Protozoa: classification and structure of Protozoa

 Of medical importance

2. Amoebae: Pathogenic (dysentery) amoeba

 Entamoeba histolytica

 Non-pathogenic amoebae: Entamoeba coli

 Endolimax nana, Iodameba butschlii

 Pathogenic free-living amoeba: Naegleria fowleri

 Acanthamoeba sp

3. Intestinal and urogenital flagellates: Giardia sp.

 Trichomonas sp.

 Intestinal ciliates: Balantidium coli

4. Blood and tissues flagellates: Leishmania sp.

 Trichomonas sp

5. Malaria Parasites : Plasmodium sp

 Coccidia: Toxoplasma sp.

6. Coccidia contd...: Isospora, Sarcocystis

 Cryptosporidium

7. Introduction to Cestodes: Pseudophyllidean tapeworm-

 Diphyllobothrium latum

Cyclophyllidean tapeworm: T.saginata, T.solium, T.multiceps, Hymenolepis nana, Diphyllidium caninum,

 Echinococcus granulosus.

 Larval cestodes : cysticercus, hydatid cyst,

 coenurus, plerocercoid

8. Introduction to Nematodes (Nematoda)

 Intestinal worms:Ascaris sp.,Trichuris sp

 Enterobius sp

9. Hookworm, Strogyloides sp

Tissuue worms: Filariae - Wuchereria sp, Brugia , Loaloa, Onchocereca, Dracunculus sp., -Larva migrans

10. Introduction to Trematodes - Intestinal flukes: F. buski, H. heterophyses, M. yokogawi

 Hepatic flukes: F. hepatica, C. sinensis

11. Hepatic flukes contd… Opisthorchis, D. dendriticum

 Pulmonary flukes: Paragonimus sp.

12. Indirect evidence of parasitic infection

**CLS 412: Laboratory Schedule**

**Weeks Subjects**

1. Introduction: Safety in the laboratory, Care of Instruments

Demonstration on the use of microscope, the different types of specimens examined, collection methods and materials.

2. A. Demonstration of microtitre plates

B. Demonstration of parasites. Draw and label

 Protozoa: Amoebae – Entamoebae histolytica

 Entamoeba coli, Iodamoeba butschlii, Endolimax nana

 Pictures of Pathogenic free-living amoebae: Naegleria sp. Acanthamoebae sp.

3. A. Repeat of previous week parasites demonstrated

B. Protozoa; Intestinal flagellates- Giardia intestinalis

 Trichomonas hominis

 Ciliates - Balantidium coli

4. A. Repeat: Intestinal flagellates, Ciliates

B. Haemoflagellates: Leishmania sp., Trypanosomes

C. Demonstration : stool examination

5. A. Haemoflagellates continued

B. Coccidia: Malaria parasites (Plasmodium sp),

 Toxoxplasma sp, --Isospora sp, --Cryptosporidium sp

C. Stains: Giemsa, Leishman, Methylene blue & Mayers haemalum

D. PRACTICAL QUIZ 1

E. Examination of stool specimens - students

6. A. Coccidia cont…

B. Examination of stool specimens - students

C. Practical Pamphlet - Dr. Bammeke

7. A. Entomology: Demonstration of some insects of medical importance:Musca domestica, Phlebotomus sp

 mosquitoes

B. Demonstration : collection of blood specimens. Students to practice staining methods using Giemsa and Leishman stains

8. A. Helminths: Nematodes: Ascaris lumbricoides

 Trichuris trichuria, Enterobius vermicularis

B. Entomology: repeat of previous week

C. Methods: Concentration of stool specimens.

9. A. Nematodes continued – reapeat of previous week

 B. Hookworms, Strongyloides stercoralis, Dracunculus

 medinensis, Filariae, Intermediate host - Cyclops

 C. Examination of stool specimens by students

D. PRACTICAL QUIZ 2

10. A. Nematodes continued repeat of previous week

B. Helminths :Cestodes - Pseudophyllidean worm- Diphyllobotrium latum, Cyclophyllidean worm - Taenia saginata. Taenia solium, Echinococcus granulosus Hymenolepis nana

C. Examination of stool specimens by students

11. A. Cestodes continued,repeat of previous week

B. Helminths: Trematodes - Fasciolopsis buski. Fasciolopsis hepatica, Paragonimus sp

 Schistosomes & The water snail intermediate hosts

12. A Trematodes continued,repeat of previous week.

B. Entomology - Glossina sp, Simulium sp. Flea.

C. UNKNOWN TEST

13. **Revision**

14. **Final Practical Examination**

**Assessments:**

Mid Term Examination Written: 15

Mid Term Examination Practical: 15

Laboratory Quizzes: 5

Oral Examination: 10

Final Practical Examination: 15

Final Theoretical Examination: 40

**References:**

1. Beaver P.C., Jung R.C. and Cupp E.W., **Clinical Parasitology**, Lea and Febiger, Latest edition
2. Beaver P.C., and Jung R.C., **Animal Agents and Vectors of Human Diseases**, Lea and Febiger – Latest edition
3. Brown H.W., and Neva F.A., **Clinical Parasitology**,Appleton and Lange, Latest edition
4. D.B. Blacklock and T. Southwell, **A Guide to Human Parasitology**, Revised by Davey T.H.- Latest edition
5. Zaman Vigar, **Atlas of Medical Parasitology**, Lea Febiger, Latest edition
6. Ash L.R. and Oriehl, **Atlas of Human Parasitology,** ASCP press, Chicago -Latest edition

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 413**

**Course Title : Clinical Bacteriology ( II )**

**Credit Hours : 2 + 1 = 3**

**Course Description:**

This course is a follow-up to CLS 411 and completes the Clinical Bacteriology courses. It deals with the study of structure and physiology of Gram-negative bacteria to include the tribes of Enterobacteriacea, the species of the following genera or groups: Pseudomonads, Vibrio , Campylobacter, Helicobacter, Bordetella, Brucella, Haemophilus, Legionella and related organisms , Spirochaetes, the anaerobic bacteria, Mycoplasmas, Chlamydia. The diseases caused by these organisms, the clinical presentation, pathogenesis, modes of transmission, laboratory diagnosis, antibiotic susceptibility testing, prevention and control will be fully discussed.

**CLS 413: Lectures Outline**

**Weeks Subjects**

1. The Enterobacteriacea: The different genera making up the group ‘Enterobacteriaceae’. Their characteristics and growth identifications.

2. Enterobacteriacea cont… Medical importance of members of this group of organisms, the disease they cause

3. Enterobacteriaceae cont…Pathogenesis, modes of transmission, antibiotic susceptibility, prevention and control

4. PSEUDOMONADS and glucose non-fermentors G(-)rods

5. The small Gram negative rods: Haemophilus, Brucella, and Bordetella, and HACEK – Characteristics and growth

6. The small Gram negative rods cont… diseases they cause, clinical presentation, pathogenesis, modes of transmission, antibiotic susceptibility, prevention and control

7. The curved G(-) rods, Vibrios: characteristics, diseases they cause, clinical presentation, pathogenesis, modes of transmission, antibiotic susceptibility, prevention and control

8. Microaerophilic ,Species of Campylobacter and Helicobacter: Characteristics, species of medical importance, diseases they cause, clinical presentation, pathogenesis, modes of transmission, antibiotic susceptibility, prevention and control

9. The Spirochaetes: Treponema species, characteristics, species of medical importance, diseases they cause, clinical presentation, pathogenesis, modes of transmission, antibiotic susceptibility, prevention and control

10. The Spirochaetes cont… Species of Borrelia, Leptospira - characteristics, species of medical importance, diseases they cause, clinical presentation, pathogenesis, modes of transmission, antibiotic susceptibility, prevention and control

11. The anaerobes: Peptococcus, Peptostreptococcus, The Lactobacilli, Propionibacteria Veillonella- characteristics, species of medical importance, diseases they, cause, clinical presentation, pathogenesis, modes of transmission, antibiotic susceptibility, prevention and control

12. The Clostridia: The pathogenic species, characteristics, species of medical importance, diseases they cause, clinical presentation, pathogenesis, modes of transmission, antibiotic susceptibility, prevention and control

13. The Clostirdia cont…

 The Bacteroides species; characteristics, species of medical importance, diseases they cause, clinical presentation, pathogenesis, modes of transmission, antibiotic susceptibility, prevention and control

14. Mycoplasma, Chlamydia ,and the Rickettsia group::

The medically important species, characteristics, and the diseases they cause.

**CLS 413: Laboratory Schedule**

**Weeks Subjects**

1. The Enterobacteriaceae – Culturing on different culture

 Media ( General, Selective and Differential )

2. The Enterobacteriaceae cont… Biochemical tests for the identification of different genera and species. Microscopic and macroscopic characteristics.

3. The Enterobacteriaceae cont…The interpretation of biochemical reactions. Identification by API.

4. Interpretation of the API tests, other semi automated method, serology of the E. Coli., Salmonellas and Shigellas

5. The Pseudomonas species: Growth on different media, pigment production, identification, O/F tests, oxidase tests …

6. Haemophilus species: culturing on different media, identification, use of X and V factors …

7. Brucella and Bordetella: culture on different media, microscopic and macroscopic morphology, identification

8. Vibrio and Campylobacter and HELICOBACTER: culture on different media, microscopic and macroscopic morphology, identification

9. Anaerobic spore bearers: The Clostridia – culturing anaerobically, microscopic morphology, spore stain,& identification

10. Clostridia continue

11. The Bactroides species: Culturing anaerobically, microscopic morphology, identification methods.

12. The Spirochaetes: Treponema and Borrelia - Microscopic morphology, serological tests for syphilis, Vincent’s stain

13. **Revision**

14. **Final Practical Examination**

**Assessments:**

Mid Term Examination: 20

Mid Term Practical Examination: 15

Absentees & reports 5

Final Practical Examination: 20

Final Theoretical Examination: 40

**References:**

1. Cossart, P., P. Boquet, S. Normark, and R. Rappuolo. **Cellular Microbiology**. ASM Press, Washington, DC, 2000
2. Vandepitte ,J and Verhaegen J,Engbaek K,Rohner P,Poit P,and C C Heuck. **Basic Laboratory Techniques in Clinical Bacteriology**.WHO,Geneva,2nd Edition 2003
3. Kaufmann, S. H. E., A. Sher and R. Ahmed. **Immunology of Infectious Diseases**. ASM Press, Washington, DC, 2001
4. Madigan, M. T., Martinko, J. M., and J. Parker. **Brock Biology of Microorganisms**. Prentice Hall, Upper Saddle River, NJ, 1997
5. Mims, C., A. Nash, and J. Stephen. **Mims' Pathogenesis of Infectious Disease**. Academic Press, San Diego, CA. 2001
6. Prescott,L. M., J. P. Harley, and D. A. Klein. **Microbiology** (3rd edition) Wm. C. Brown Publishers, Dubuque, IA, 1996
7. Salyers, A. A. and D. D. Whitt. **Bacterial Pathogenesis. A Molecular Approach**. ASM Press, Washington, DC, 1994
8. Tortora, G. J., B. R. Funke, and C. L. Case. **Microbiology, An Introduction**. (7th edition) Benjamin Cummings, San Francisco, 2002.

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 414**

**Course Title : Immunology**

**Credit Hours : 3 + 1 = 4**

**Course Description:**

This course is designed to give a basic understanding of theoretical and practical aspects of immunology. The first part of the course deals with the basic aspects of Immunology – Types of immunity, immune response, characterization of antigens, the humoral response ( different classes of antibodies ), the Complement system, the cellular response ( different types of T cells and their functions, the cytokines ), the immune regulation.

The second part of the course covers the Clinical aspects of immunology – Immunopathology, immunity to microbial infections, types of hypersensitivity reactions, auto-immune diseases,immunodeficiency diseases, transplantation, tissue typing and rejection.

**CLS 414: Lectures Outline**

**Weeks Subjects**

1. Introduction: history and terminology

 Types of immunity (natural and acquired immunity)

2. Innate (natural) immunity, parameters and mechanism

3. Antigens, immunogenicity, types of antigens & mitogens

4. Organs and tissue of the immune system, primary and secondary lymphoid organs

5. Cells involved in immune responses - types and subtypes, sites of their developments - their functions

6. The immune response: humoral response, primary and secondary immune response , primary and secondary immune response, mechanism of antibody production

7. Antibodies: structure, classes, subclasses and characters of immunoglobulins as well as their functions and uses

8. Monoclonal antibodies, hybridoma technology, and their applications. Anti-idiotypic antibodies and their uses

9. Complement system: characters, mechanism of activation, biological functions and techniques involving complement

10. Major Histocompatibility Complex (MHC) antigens,Human leukocytes Antigens (HLA). Cellular distribution, structure and functions of MHC antigens.

11. The cellular immune response: mechanism of cytotoxicity reactions and measurement of cytotoxicity *in-vitro*, types and functions of cytokines. Treg cells

12. Immunoregulation and immunoprophylaxis

 Clinical Immunology: Immunity to microbial infections

13. Immunopathology: Types of hypersensitivity (Types 1,II, III, and IV )

14. Transplantation and Tissue typing, mechanism of tissue rejection

15. Autoimmune diseases and immunodeficiency diseases

**CLS 414: Laboratory Schedule**

**Weeks Subjects**

1. Introduction: Separation of serum, plasma and complement. Serial dilutions & micro titration

 Serological tests (Ag-Ab interactions)

2. Agglutination test: Slide Agglutination test

 Tube agglutination test

3. Erythrocyte Passive haemagglutination test

Reverse Passive haeamagglutination test,

VDRL for syphilis

4. Precipitation test: double immunodiffusion test

 Single radial immunodiffusion test

5. Electrophoresis and Immuno-electrophoresis

Counter immuno-electrophoresis

6. Anti-streptolysin O Titration

7. Complement Fixation Test

8. Mid Term Practical Examination

9. Enzyme linked Immuno Sorbant Assay (ELISA) (Direct & Indirect)

10. Direct and Indirect Immunofluorescence Test

11. Methods in Cell Mediated Immunity: Isolation and identification of lymphocyte populations

12. **Revision**

13. **Final practical Examination**

**Assessments:**

First Mid Term Examination: 15

Second Mid Term Examination: 15

Laboratory Quizzes: 5

Mid Term Practical Examination: 5

Final Practical Examination: 20

Final Theoretical Examination: 40

**References:**

1. Peter J. Delves et al., **Roitt’s Essential Imunology**, Blackwell Publishing, Latest Edition July 2006
2. Ian R. Tizard., **Immunology- An Introduction**, Saunders College Publishing, Latest Edition.

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 415**

**Course Title : Virology**

**Credit Hours : 2 + 0 = 2**

**Course Description:**

This course deals with virus structures, morphology and classification. It also covers the physical, biochemical, and biological characters of viruses which include: virus-cell relationship (virus replication cycle), virus-host relationship (virus pathogenesis) and virus immunity. A general outline for laboratory isolation and identification of viruses in clinical specimens will be presented. The clinical presentation of some virus diseases, their pathogenesis, laboratory diagnosis, prevention and controls will also be discussed.

**CLS 415: Lectures Outline**

**Weeks Subjects**

#### 1. Introduction: history and terminology

2. Virus characters - physical and biochemical

3. Basis of virus classification

4. Virus replication cycle (virus-cell relationship)

5. Virus pathogenesis and virus immunity

6. Laboratory identification of viruses in clinical specimens:

 Direct diagnosis based on isolation, morphological and

 biochemical characters

7. Laboratory diagnosis of viruses in clinical specimens:

 Serological identification, Molecular diagnosis based on

 identification of virus nucleic acid, using DNA probe, DNA

 fingerprint and PCR

8. Hepatitis viruses (HAV, HEV, HDV and TTV)

 Characters, epidemiology, pathogenesis and laboratory

 diagnosis

9. Hepatitis viruses (HBV & HCV) - Characters,

 epidemiology, pathogenesis and laboratory diagnosis

10. Human Immunodeficiency Virus (HIV): types,

 characteristics, pathogenesis, epidemiology and

 laboratory diagnosis

11. Herpes viruses: types, characteristics, importance and

 laboratory diagnosis

12. Encephalitis viruses: characteristics, pathogenesis and

 laboratory diagnosis

13. Meningitis viruses: characteristics, pathogenesis and

 laboratory diagnosis

14. Viral vaccines and anti-virus resistance

**Assessments:**

First Mid Term Examination: 30

Second Mid Term Examination: 30

Final Examination: 40

**References:**

Louis S. Kucera and Quentin N. Myrvik, **Fundamentals of Medical Virology for Students of Medicine and Related Sciences**, Publisher Lea Fabiger – Latest Edition

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 416**

**Course Title : Environmental Microbiology**

**Credit Hours : 1 + 1 = 2**

**Course Description:**

This course is designed to provide the students with an understanding of the vital activities that microorganisms perform in nature and in the broader dimension of organic activities in the total ecosystem. Students will learn about the useful and harmful roles of microorganisms in the food and dairy industries. The use of microorganisms in industrial processes, the treatment of waste materials and microbial quality controls will also be discussed.

**CLS 416: Lectures Outline**

**Weeks Subjects**

1. Fundamentals of microbial ecology- Characteristics of microbial ecosystems, microorganisms and their ability to cause changes; Adaptation

2. Microbial symbiosis: Neutralism, mutualism, comensalism, antagonism, competition, parasitism and predation

3. Epidemiology of infectious diseases: Terminology, disease reservoirs, modes of transmission, and public health measures for the control of epidemics

4. Epidemiology of zoonotic diseases: Viral, bacterial, and parasitic zoonoses; prevention and control of zoonotic diseases

5. Air Microbiology – Indoor and outdoor air, airborne diseases and its transmission, control of microorganisms in the air

6. Water Microbiology – Water sources, microbial content of water, pollution of water

7. Environmental sanitation: Types of sewer lines, treatment of sewage, sewage transmitted diseases

8. Microorganisms involved in the spoilage of different types of food and milk

9. Microorganisms involved in the spoilage of food continued … Food borne diseases: Infection, intoxication;

10. Food borne diseases continued … Infection, intoxication; prevention and control of food borne diseases

11. Nosocomial infections: Predisposing factors, endogenous and exogenous infections, sources, control measures

12. Laboratory acquired infections: Classification of organisms into Risk groups, safety precautions when handling each Risk group, hazardous laboratory techniques and processes

13. Microbial production processes: Characteristics of microbial fermenters, different types of microbial processes – dairy, pharmaceutical, single cell protein

**CLS 416: Laboratory Schedule**

**Weeks Subjects**

1. Microorganisms in the air

Air sampling – Indoors / outdoors, exposure plates, different duration of exposures

2. Aerosols : Bacteriological laboratory techniques that create aerosols, sneeze effect

3. Environmental sampling from surfaces – Rodac plate, swab

4. Examination of water – Recreational water, drinking water

 Microbial analysis of water – Most Probable Number

5. Microbial analysis of water continued … Millipore filter technique

6. Microbial analysis of milk – Standard plate count

7. Microbial analysis of milk continued … Reductase test, Phosphatase test, Brucella Ring test

8. Food spoilage microbiology: Enumeration of food spoilage organisms ( some fruits and vegetables )

9. Estimation of viable count of microbial flora in meat and meat by-products

10. Estimation of coliforms counts in meat and meat by-products

11. Isolation of pathogens in foods

12. Food poisoning continued … identification methods of isolated pathogens

13. **Revision**

14. **FINAL PRACTICAL EXAMINATION**

**Assessments:**

First Mid Term Examination: 15

Second Mid Term Examination: 15

Laboratory Quizzes: 5

Mid Term Practical Examination: 5

Final Practical Examination: 20

Final Theoretical Examination: 40

**References:**

1. Eugene W. Nester et al., **Microbiology-A Human Perspective**, Mac Graw Hill, USA. Latest Edition
2. Tortora, G. J., B. R. Funke, and C. L. Case. **Microbiology, An Introduction**. (7th edition) Benjamin Cummings, San Francisco, 2002
3. Cano J. Raoul and Calome J.S., **Microbiology**, West Publishing Company, USA, Latest Edition

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 417**

**Course Title : Clinical Practice in Microbiology**

**Credit Hours : 1 + 2 = 3**

**Course Description:**

This final microbiology course involves lectures as well as practical sessions in a hospital Microbiology laboratory. The lectures will deal mainly with specimens received in the bacteriology laboratory, their collection, suitability, and processing. The students will be introduced to the safety measures implemented in the laboratories. They will learn about culture media preparation and sterilization, processing of specimens, isolation/ identification of organisms, and antibiotic susceptibility testing. The diagnostic techniques in the routine Clinical Immunology, Mycology and Virology laboratories will also be taught.

**CLS 417: Lectures Outline**

**Weeks Subjects**

1. Bacteriological culture media

Basic constituents / preparation / sterilisation

Types of bacteriological culture media

2. Urine Specimens – Types of / collection

 Processing for chemical analysis

3. Bacteriology of urine specimens continued …

Pathogens isolated from urine specimens

 Processing of urine specimens for routine culture

 sterile pyuria

4. Blood culture /Indications for

Timing and technique for blood collection

 Manual / Automated processing of blood culture

5. Sputum culture / Indication for / Collection

Processing of sputum in routine respiratory tract infections

 6. Processing of sputum in pulmonary tuberculosis by conventional / automated methods

Antimycobacterial susceptibility testing by conventional and automated methods

7. Stools specimens / indications for culture

 Pathogens isoloated from faecal specimens

8. Processing of stools for culture / Isolation and identification of different organisms

9. Preparation of stools specimen for examination of

 parasites

10. General bench specimens: CSF / Pus / Ear/

Conjunctiva / Genital / Nasal / Throat- indications for taking these specimens / collection / processing

12. Commonly used serological tests in clinical bacteriology

 Widal / CFT / ASO , Serological test of syphilis specific

 and non-specific: RPR,VDRL,TPHA, FTA ,CRP,

 Pregnancy test, TORCH, organ transplant

 matching(MHC)& FC

13. Rapid review in diagnosis of common viral infections.

 Tissue culture types- CPE

 CPE / EIA / Immunofluorescense

1. Rapid review in diagnosis of common fungal infections -

 Microscopic examination and culture of specimens in

 Mycology

**CLS 417: Laboratory Schedule**

**Weeks Subjects**

1. Bacterial culture media preparation / sterilisation and review of the commonly used media

2. Urine examination – pH, chemical analysis

 Microscopic examination of deposit.

 Culture of urine specimens & Identification of isolates

3. Sterile fluids and CSF processing, cultures.and

 Identification of isolates

4. Blood – collection / processing methods

 Subculture of blood specimens for isolation /

 Identification of isolates-susceptibility testing

5. Sputum specimens – Macroscopic / microscopic

 Examination – Gram, Fluorescent, ZN staining

 Culture and identification of isolates.

6. Culture and identification Mycobateria by conventional / automated methods

7. Stools specimens – macroscopic and microscopic examination for parasites

 Culturing of stools specimens on various culture media

8. Isolation / identification of pathogens

 Serology of the salmonellas, shigellas, …

9. GENERAL BENCH SPECIMENS

 ( ear, eye, throat, nose, CSF, pus, genital …)

 Macroscopic and microscopic examination

 Processing of specimens. Isolation , identification

 of isolates

10. CLINICAL MYCOLOGY

 Specimen collection; Examination of KOH / LPCB mounts

 Review of different culture media used in mycology

11. CLINICAL IMMUNOLOGY

 Review on the different serological tests related to

bacterial infection diagnosis ( Widal , RPR, VDRL, ASO , CFT tests )

12. CLINICAL VIROLOGY

Processing of specimens in Virology Microscopic examination of tissue cultures and CPE.

 Review of the different serological methods

13. **Revision**

14. **Final Practical Examination**

**Assessments:**

Mid Term Examination(1): 15

Mid Term Examination(2) 15

Absentees & reports 10

Final Practical Examination: 20

Final Theoretical Examination: 40

**References:**

1. Cossart, P., P. Boquet, S. Normark, and R. Rappuolo. **Cellular Microbiology**. ASM Press, Washington, DC, 2000
2. Vandepitte ,J and Verhaegen J,Engbaek K,Rohner P,Poit P,and C C. Heuck. .**Basic laboratory in Clinical Bacteriology**.WHO,Geneva,2nd Edition 2003
3. Kaufmann, S. H. E., A. Sher and R. Ahmed. **Immunology of**

 **Infectious Diseases**. ASM Press, Washington, DC, 2001

1. Madigan, M. T., Martinko, J. M., and J. Parker. **Brock Biology of**

 **Microorganisms**. Prentice Hall, Upper Saddle River, NJ, 1997

1. Mims, C., A. Nash, and J. Stephen. **Mims' Pathogenesis of Infectious Disease**. Academic Press, San Diego, CA. 2001
2. Prescott,L. M., J. P. Harley, and D. A. Klein. **Microbiology** (3rd edition) Wm. C. Brown Publishers, Dubuque, IA, 1996
3. Salyers, A. A. and D. D. Whitt. **Bacterial Pathogenesis. A Molecular Approach**. ASM Press, Washington, DC, 1994
4. Tortora, G. J., B. R. Funke, and C. L. Case. **Microbiology, An Introduction**. (7th edition) Benjamin Cummings, San Francisco, 2002
5. Stephen H. Gillespie.**Medical Microbiology Illustrated.**Butterworth-Heineman Ltd. Latest edition.

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 421**

**Course Title : Pathophysiology**

**Credit Hours : 2 + 1 = 3**

**Course Description:**

At the completion of this course the student will know the normal structure and functions of the body systems studied. Student should be able to understand the pathophysiology of the most common diseases, its manifestations and the diagnostic methods used.

**CLS 421: Lectures Outline**

**Weeks Subjects**

1,2,3,4. Cardiovascular System

* Physiology and Manifestations
* Congenital Heart Disease, Valvular Disease, Rheumatic disease
* Vascular Disease, Atherosclerosis, Ischemic Heart disease
* Hypertension, Hypotension, Heart Failure

5,6,7,8. Respiratory System

* Physiology and Manifestations
* Pneumonia, Tuberculosis
* Obstructive Disease
* Respiratory Failure

9. Female Genital System

* Physiology and Manifestations
* Causes of Abnormal Uterine Bleeding, Toxemia

10,11,12. Urinary System

* Physiology and Manifestations
* Glomerulonephritis, Causes of Urinary Obstruction
* Renal Failure

13. Digestive System

* Physiology and Manifestations
* Common diseases of the digestive system

14,15. Endocrine System

* Physiology and Manifestations
* Common endocrine diseases

**CLS 421: Laboratory Schedule**

**Weeks Subjects**

1. Explaining clinical cases & its relation to disease process

2. Cardiovascular system:

Technique for measuring blood pressure

3. Clinical cases

Heart failure, congenital heart diseases, myocardial infarction

4. Clinical cases

Rheumatic heart, Atherosclerosis, aneurysm, varicose vein

5. Clinical cases

Respiratory system Upper respiratory airways Lower respiratory airways.

6. Clinical presentation

7. Digestive system (GIT).

8. Digestive system (liver & jaundice

9. Renal disease Clinical cases

10. Endocrine diseases Clinical cases

11. Clinical presentations

12. Clinical presentation

13. **REVISION**

14. **FINAL PRACTICAL EXAM**

**Assessments:**

First Mid Term Examination: 20

Second Mid Term Examination: 20

Final Practical Examination: 20

Final Theoretical Examination: 40

**References:**

1. Carol Mattson and Porth, **Pathophysiology: Concepts of Altered Health States,** J.B. Lippoincott Company, NY, London.

1. Sylvia A. Price and Lorrain M. Wilson, **Pathophysiology: Clinical Concepts of Disease Processes,** Mosby; 6 edition (October 15, 2002).

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 422**

**Course Title : Cytopathology**

**Credit Hours : 1 + 1 = 2**

**Course Description:**

This course will provide the student with the basic knowledge of the theory and practical aspect in the diagnosis of tumour cells and non-malignant conditions. This can be achieved by microscopic examination of smears prepared from exfoliated cells or fine needle aspirated material. The course will enable the student to identify through the microscope, the normal and malignant cells by which malignant tumours can be diagnosed. The students also will be trained in the different technical methods applied in smears preparation and self precautives from contacting infections.

**CLS 422: Lectures Outline**

**Weeks Subjects**

1,2. Introduction to cytology

 The anatomy & histology of the female genital tract

3. The normal constituents of Pap-smear

 The normal cytology of female genital tract and other

 cells of the body

3. Hormonal Cytology

4,5,6. Inflammation: Criteria and causes

Diagnostic cytology of different inflammatory

 Smears

7. Premalignant and Malignant criteria

8. Diagnosis of malignancy in Pap smear “cytology of

 malignant cells”

9. Introduction to non-gynaecology cytology and the diagnosis

 of neoplastic and non- neoplastic cells from many parts of

 the body

10. Sputum, bronchial wash and bronchial brush cytology

11. Body fluids cytology “cytology of serous effusion”

12. Fine needle aspiration cytology (general information)

13. Urine, oral and C.S.F cytology

**CLS 422: Laboratory Schedule**

**Weeks Subjects**

1. Introduction to cytology laboratory work

2. Screening histology and cytology slide of the normal

 cellular constituents of Pap smear

3. Papanicoloau staining method and screening cytology

 Slides for normal cytology

4. Practice screening of hormonal cytology

5. Screening abnormal (inflammatory) cervical smears

 and identifying the causes of inflammation

6,7. Screening smears and identifying benign and

 malignant cells

8. Smear preparation from sputum and non-

 gynaecological samples

9. Screening smears for the identification of malignant

 cells in sputum, bronchial wash and bronchial brush

 smear

10. Screening body fluid smears for malignant cell

 Identification

11. Urine cytology, Oral cytology, C.S.F cytology

12. Final staining exam (specimen is taken from oral

 buccal cavity)

13. **REVISION**

14. **FINAL PRACTICAL EXAM**

**Assessments:**

First Mid Term Examination: 15

Second Mid Term Examination: 15

Laboratory Quizzes: 5

Mid Term Practical Examination: 5

Final Practical Examination: 20

Final Theoretical Examination: 40

**References:**

Chandra Grubb, **Diagnostic Cytopathology**, Churchill Livingstone, London &New York.

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 431**

**Course Title : Clinical Enzymology**

**Credit Hours : 1 + 1 = 2**

**Course Description:**

This course deals with the study of the theoretical and practical aspects of chemical structures and actions of various enzymes, their assay methods, and clinical applications in the diagnosis of diseases related to disorders of: liver, kidneys, intestines, pancreas, bones or muscles – including heart muscles.

**CLS 431: Lectures Outline**

**Weeks Subjects**

1,2. Introduction

* Arrangement of enzymes inside cells
* Function of enzymes as catalysts
* Enzyme action and the equilibrium constant of a reaction
* Specificity of enzymes
* Chemical properties of enzymes, three dimensional specificity and stereochemistry
* Active sites of enzymes
* Classification of enzymes

3. Enzyme activity and kinetics

* Influence of temperature & pH on enzyme activity
* Influence of substrate concentration on enzyme activity
* The Michaelis-Menten Km constant
* The Lineweaver-Burk plot
* Measurement of enzyme activity in biological fluids, provision of optimal conditions

4. Mechanisms of Enzyme inhibition

* Types of enzyme inhibitors
* Competitive inhibitors
* Non-competitive inhibitors
* Un-competitive inhibitors
* Examples of metabolic inhibitors

5,6. Mechanisms of Enzyme action

* Mechanisms of the Enzyme-Substrate (ES) formation/dissociation
* Nature of the (ES) complex
* Bonding of the substrate to enzymes
* Isoenzymes
* Regulation of enzyme activity; Zymogens, Allosteric regulation
* Prosthetic groups & Coenzymes
* Reduced coenzymes

7-13. **Enzymes as clinical markers of disease**

* Use of serum enzymes in diagnosis of disease:
* Transaminases
* Alkaline & Acid phosphatases
* Lactate dehydrogenases & its isoenzymes
* Creatine kinase & its isoenzymes
* Amylase & Lipase
* Ornithine Transcarbomylase
* 5' – Nucleotidase
* Carboxylases & organic acidemias
* Use of enzyme assays in tissue homogenates

**CLS 431: Laboratory Schedule**

**Weeks Subjects**

1. Determination of Transaminases

2. Determination of Creatine Kinase

3. Determination of Lactate dehydrogenase

4. Determination of Alkaline phosphatase

5. Determination of Acid phosphatase

6. Determination of gamma-Glutamyl transferase

7. Determination of Amylase

8. Determination of Lipase

9. Determination of G6PD

10. Determination of Cholinesterase

11. Determination of Isocitrate dehydrogenase

12. Determination of 5-Nucleotidase

13. Determination of Aldolase

**Assessments:**

First Mid Term Examination: 15

Second Mid Term Examination: 15

Laboratory Work and Reports: 15

Final Practical Examination: 15

Final Theoretical Examination: 40

**References:**

1. Burtis and Ashwood, **Teitz fundamentals of Clinical Chemistry**, 4th edition, Saunders, 2000.
2. Alex Kaplan, **Clinical chemistry: Interpretation and techniques**, 4th edition, by Williams & Wilkins, 1994.

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 432**

**Course Title : Clinical Practice in Biochemistry**

**Credit Hours : 1 + 1 = 2**

**Course Description:**

This course is designed to train students in routine procedures performed in a biochemistry laboratory . Laboratory part of the course will be done under the supervision of a trained technologist in a hospital laboratory .

After completion of the course students should have a good knowledge of laboratory skills required for a clinical chemistry laboratory to include: overall organization, safety precautions, specimen handling and quality control procedures. They will be able to perform routine and special chemistry test in serum or urine using manual, semi automated or automated equipment .

**CLS 432: Lectures Outline**

**Weeks Subjects**

1. Safety precautions :

* Special reference to minimum safety precautions, hepatitis and AIDS

 Specimen handling / processing .

* Receiving , master log, distribution to work areas, analysis, collection of data , reporting ,data retrieval, storage of specimens

2. Quality control

* QC on equipment, reagents, standards, procedures followed in the laboratory, review last three months charts, critique on the procedures

 Other

* Orders, supplies, inventory, maintenance and repair
* Laboratory administration

3,4. Radioimmunoassay / Enzyme immunoassay / ELISA

* For each test, review clinical significance , principle employed in the test procedure, test protocol , results, interpretation of the date and quality control

5,6. Electrophoresis

* General considerations, factors that affect the separation, support media , classification , clinical applications
* Electrophoretic procedures on serum proteins, isoenzymes ( CK, LDH ) and Hb variants .
* Quantitaion procedure, interpretation of results and quality control

7,8. Use of automated equipment

* The routine tests performed on serum, plasma or urine to cover the quantitation procedure, interpretation of results, and quality control

9. Glucose, cholesterol, triglycerides urea, creatinine

10. Sodium, potassium, chloride, CO2, billirubin, albumin

11. Amylse, alkaline phosphatase, acid phosphates, ALT

 and AST

12,13. Review, problem solving, critique

**CLS 432: Laboratory Schedule**

**Weeks Subjects**

1,2. Safety procedures :

* Minimal safety precautions
* Contaminated equipment / glassware
* Flammables
* Chemical hazards
* Radioisotopes
* Hepatitis, AIDS etc .
* Laboratory safety manual

 Specimen handling / processing :

* Receiving
* Master log/ lab. Etc .
* Distribution to work areas
* Test protocol
* Analysis, collection of data
* Storage of specimens
* Limitations on storage

 Quality Control :

* Quality control on equipment , reagents , standards etc.
* Quality control procedures followed in the laboratory
* Review previous 3 months Quality control data

 (charts, graphs etc.)

* Critique on the procedures followed
* Suggestions

 Orders, supplies, equipment :

* Inventory
* Orders
* Supply

 Laboratory administration :

* Administrative
* Technical , bench work
* Space utilization

3,4,5. Special chemistry – Radioimmunoassay

Lecture and tutorial :

For each test , review of clinical significance, principle employed in a test

Procedure, test protocol , results, interpretation of data , and Quality control .

Trouble shooting in test procedure / equipment .

Orientation to RIA laboratory , test protocols, use of radiolabel material

quality control .

RIA of a hormone utilizing the procedure on a protein / steroid hormone

employing a double antibody for separation method. calculation of results

and interpretation of the data .

RIA of a hormone employed solid phase method.

Calculation of results and interpretation of the data .

6,7,8. Special chemistry – Electrophoresis

Lecture tutorial and hospital schedule:

Serum protein Electrophoresis :

Procedure , results and interpretation of results .

Isoenzymes – lactate dehydrogenate – Enzymology localization , results

and interpretation .

Haemoglobin :

Haemoglobinopathies, thalassemias , haemoglobin electrophoresis, results

and interpretation .

9-14. Routine chemistry

Lecture, tutorial and hospital schedule:

Use of automated and other equipment for routine tests performed on

serum , plasma or urine, to include the following :

Glucose, urea, creatinine , sodium , potassium , chloride, CO2 , uric

acid , calcium, CPK, billirubin , albumin , cholesterol , triglycerides,

alkaline phosphates, amylase, acid phosphates, ALT and AST .

**Assessments:**

First Mid Term Examination: 15

Second Mid Term Examination: 15

Laboratory Quizzes: 5

Mid Term Practical Examination: 5

Final Practical Examination: 20

Final Theoretical Examination: 40

**References:**

1. Burtis and Ashwood, **Teitz fundamentals of Clinical Chemistry**, by Saunders.
2. Bishop, Fody and Choeff, **Clinical chemistry: principles, procedures and correlations**, by Lippincott.

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 441**

**Course Title : Immunohaematology**

**Credit Hours : 2 + 2 = 4**

**Course Description:**

Thesubject develops skills and knowledge required for proficiency in the safe supply of human blood products. A review of antibody antigen interaction will lead into the practical application of antibody screening, identification and compatibility testing. Quality assurance and safety of the blood supply will be recovered. Case study presentation will lead the student through problem solving incompatible reactions, situations they will likely encounter in a working laboratory. Advanced techniques and current developments in stem cell transplant and cord blood banking will also be discussed,

**CLS 441: Lectures Outline**

**Weeks Subjects**

1. Introduction to Immunohaematology

2. ABO Blood Group System

3. The Rh Blood Group System

4. Other Blood Group System

5. Antihuman Globulin (Coombs’) Test

6. Detection and Identification of Antibodies

7. Cross Matching (Compatibility Testing)

8. Transfusion Reactions and Complications

9. Screening for Diseases Transmitted through Blood

10. The Blood Donor and Collection of Blood

11. Storage and Preservation of Blood and Components

12. Haemolytic Disease of the Newborn (HDN)

13. Autoimmune Haemolytic Anaemia (AIHA)

14. Blood Components

15. Transfusion Therapy

**CLS 441: Laboratory Schedule**

**Weeks Subjects**

1. ABO Grouping

 Rh Typing

2. Compatibility Testing

 Investigation of Transfusion Reactions..

3. Antiglobulin Test

 Antibody Identification

4. Antibody Titration

 Hemolysin Test

5. Cold Agglutinin Studies

 Hemolytic Disease of Newborn—Exchange Transfusion

6. Reconstitution of red cells with Y-Set..

 Landsteiner Heat Eluate

7. Donor Blood Processing

 Rapid Plasma Reagin Test

8. Leukocyte Poor Red Cells

9. Washed Red Cells

10. Preparation of Platelet Concentrates....

11. Preparation of Fresh Frozen Plasma

12. Preparation of Cryoprecipitate

13. Preparation of Reagents

14. Quality Control

15. Assessments

**Assessments:**

Mid Term Examination: 20

Mid Term Practical Examination: 20

Assignment: 10

Final Practical Examination: 20

Final Theoretical Examination: 30

**References:**

1. SR Mehdi, Jaypee, **Essentials of Blood Banking, A Handbook for students of Blood Banking and Clinical Residents**, Brothers Medical Publishers (P) LTD, ISBN 81-8061-642-8
2. Sally V. Rudmann, **Textbook of Blood Banking and Transfusion Medicine**, ISBN 0-7216-3453-2
3. Kathy D. Blaney and Mosby, **Basic and Applied Concepts of Immunohematology**, 2000 ISBN 0-323-00165-3
4. **Technical Manual -American Association for Blood Banks (AABB)** 14th ed., ISBN 1-56395-062-9

1. Barbara H. Estridge, Anna P. Reynolds and Norma J. Walters, **Basic Medical Laboratory Techniques ,** 4th editionISBN: 0-7668-1206-5

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 442**

**Course Title : Clinical Practice of Haematology**

**Credit Hours : 1 + 1 = 2**

**Course Description:**

The students will be introduced to and learn the working system of routine haematology laboratory and the Blood Bank. The need is for the students to follow the routine laboratory work starting from specimen collection right through to sending results to the clinicians. Some attention will be given to interpretation of results and identification and quick reporting of grossly abnormal life threatening results to the clinicians.

In the Blood Bank, the students will be encouraged in participating in the production of blood products ( packed cells, platelets concentrates, fresh frozen plasma, …. ) and in the production of cryoprecipitate.

**CLS 442: Lectures Outline**

**Weeks Subjects**

1. Haemolytic Anaemias: General and Inherited membrane

 and enzyme defects

2. Bone marrow failure

3. Chronic myeloid leukaemia

4. Mye]odysplasia

5. Multiple Myeloma

6. Lymphoma: Hodgkin lymphoma

 Non-Hodgkin lymphoma

7. Disorders of haemostasis: vessel wall and platelets

8. Disorders of coagulation: Inherited and Acquired

9. Thrombosis and thrombophilia

10. Haernatological aspects of disease:

 Renal, liver, endocrine pregnancy

11. Blood transfusion and Stem cell transplantation

12. Blood bank policy

13. Complications of blood products

14. Case studies

15. Assessments of the course

**CLS 442: Laboratory Schedule**

**Weeks Subjects**

1 to 3 Phlebotomies, specimen collection and registration

4 to 6 Mean donor collection and processing of blood donor

7 to 9 Mean Blood bank and blood transfusion processes.

10 to 12 Coagulation laboratory units

13 to 15 Mean Laboratory Haematology, Electronic machines

 Reading blood film

**Assessments:**

Mid Term Examination: 20

Mid Term Practical Examination: 20

Assignment: 10

Final Practical Examination: 20

Final Theoretical Examination: 30

**References:**

1. Sir John V. Dace & SM Lewwis, **Practical Haematology,** ISBN: 0 443 01981 9
2. Atu Mehta & Victor Hoffbrand, **Haematology at a Glance**, ISBN 10-4051-2666-3
3. Shirish M Kawthalkar, **Essentials of Haematology,** ISBN 81-8061-633-9
4. Hoffbrand AV, Pettit JE, PAH Moss, **Essential Haematology,** 4th ed. 2001, Blackwell Scientific Publications, ISBN 0632051531

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 451**

**Course Title : Laboratory Management**

**Credit Hours : 2 + 0 = 2**

**Course Description:**

The course is on the different types of medical laboratories, management functions, in clinical laboratories, organization and supervision involving laboratory design & space utilization, steps in clinical laboratory work flow, work schedule and work load measurements, productivity. Emphasis on quality control in clinical laboratories (choice of quality control materials), preventive maintenance and safety measures in quality control monitoring, education of laboratory personnel, budgeting consideration in clinical laboratory.

**CLS 451: Lectures Outline**

**Weeks Subjects**

1. Introduction: Clinical Laboratory Organization

* Status of laboratories (hospital, public health, reference, specialty, private)

 The Management functions.

* Planning, organizing coordinating, directing, controlling.

2. Organization and Supervision

* Laboratory design, space utilization
* System approach and organization theory

3. Steps in Clinical Laboratory Workflow

* Collection and delivery of specimens
* Specimen receiving and entry
* Test performance
* Recording and reporting results

 Procedural and Instrumentational Requirements

* Work Schedule
* Workload measurement
* General consideration
* Systems of measurement

4. Productivity

* Personnel requirements
* Choosing the type of employee for the job
* Problem solving

 Personnel Relations

* General considerations
* Job description
* Evaluation of performance

5. Communication in Clinical Laboratory

* Channels of communication
* Factors affecting communication
* Intra-laboratory and inter-laboratory communication

6. Budget consideration in Clinical Laboratory

* Volume forecasting, labour cost, productivity index, materials and services equipment purchase, budget monitoring

7. Material Management

8. Quality Control in Clinical Laboratory

* Implementing Q.C. program
* Evaluation of a test methodology
* Choice of quality control materials

9. Preventing maintenance in Quality Control Monitoring

 Safety Measures in Quality Control Monitoring

10. Quality Assurance in Clinical Laboratory

* Certification
* Proficiency
* Patient test management

11. Accreditation

12. Education of Laboratory Personnel

* Continuing education programs

13. Information Systems

**Assessments:**

First Mid Term Examination: 30

Second Mid Term Examination: 30

Final Theoretical Examination: 40

**References:**

1. [L. Houang](http://www.amazon.com/exec/obidos/search-handle-url/103-7829156-8723856?%5Fencoding=UTF8&search-type=ss&index=books&field-author=L.%20Houang), [M. M. El-Nageh](http://www.amazon.com/exec/obidos/search-handle-url/103-7829156-8723856?%5Fencoding=UTF8&search-type=ss&index=books&field-author=M.%20M.%20El-Nageh), (1993) (eds) **Principles of Management of Laboratories,** World Health Organization (August 1993).
2. Hutchison Doug (1994) **Total Quality Management in the Clinical**

 **Laboratory**. ASQC Quality Press, Milwaukee, Wisconsin.

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 452**

**Course Title : Independent Study**

**Credit Hours : 2 + 0 = 2**

**Course Description:**

The objective of this course is to give selected students an introduction of research on a limited. Small topic of their choosing and interest. They will learn the philosophy and tools of research such as how to review literature, how to write a research plan and protocol , and how to analyze, write up and present results of their study .

**Department :** **Clinical Laboratory Sciences**

**Course Number : CLS 453**

**Course Title : Medical Genetics**

**Credit Hours : 2 + 1 = 3**

**Course Description:**

This course is designed to give a basic understanding of the theoretical and practical aspects of medical genetics. In addition to molecular medical genetics includes cytogenetics, DNA, RNA, mutation, mutation detection technique, PCR, cloning, population genetics and clinical genetics. In the practical applies al the technique used in medical genetics like gel electrophoresis, DNA extraction, PCR and bioinformatics.

**CLS 453: Lectures Outline**

**Weeks Subjects**

1. History of Genetics

2. The Cell

3. Cytogenetics (Chromosomes)

4. DNA Structure and Function

5. Mutation

6. Mutation Detection Techniques

7. PCR

8. Cloning

9. Population Genetics

10. Clinical Genetics and Genetic Disorders

11. Chromosomal disorders

12. Single gene disorders

13. Sickle Cell Anaemia & Thalassemia

**CLS 453: Laboratory Schedule**

**Weeks Subjects**

1. Safety and Precautions in pre-PCR, PCR and post-

 PCR: avoiding contamination; how to handle DNA

 samples

2. Buffer and Electrophoresis:

* TAE Stock Buffer
* TBE Stock Buffer
* Agarose Gel
* Polyacrylamide Gel (PAGE)
* Stains

3,4. DNA Extraction

 RNA Extraction

 Tissue Extraction

5. PCR Amplification

 Design Primers

 Reagents to be used (Kit)

 DNA Marker (Ladder)

6. Bioinformatics:

* Database of Genes
* Gene Bank
* Gene Map

7-13. Technique used after PCR

* Mutation Detection
* SSCP
* DHPLC
* Restriction Enzymes
* ARMS
* ASO
* Sequencing

**Assessments:**

First Mid Term Examination: 20

Second Mid Term Examination: 20

Final Practical Examination: 20

Final Theoretical Examination: 40

**References:**

Margaret W.Thompson, **Genetics in Medicine**, W B Saunders Co; 5th edition