

**CURRICULUM
FOR
SECOND SEMESTER
OF
THREE-YEAR
DIPLOMA COURSES
IN
POLYTECHNICS
OF
UNION TERRITORY
OF
JAMMU AND KASHMIR**

CURRICULUM

FOR

SECOND SEMESTER

DIPLOMA IN

MEDICAL LAB TECHNOLOGY

SUBJECT STUDY SCHEME (2nd Semester: MEDICAL LAB TECHNOLOGY)

Course Code	Subjects	Time in Hours				CREDITS		
		Theory	Tutorial	Practical	Total	Theory	Practical	Total
ES202	Introduction to Computers and Information Technology	---	---	4	4	----	2	2
MLPC201	Clinical Pathology	2	-----		2	2	--	2
MLPC202	Clinical Pathology LAB			4	4		2	2
MLPC203	Anatomy and Physiology-II	2	-----		2	2	--	2
MLPC204	Anatomy and Physiology-II LAB			2	2		1	1
MLPC205	Clinical Microbiology-II	3	-----		3	3	---	3
MLPC206	Clinical Microbiology-II LAB	---	----	2	2		1	1
MLPC207	Clinical Hematology-II	2	-----		2	2	---	2
MLPC208	Clinical Hematology-II LAB			2	2		1	1
MLPC209	Clinical Biochemistry-II	3	-----		3	3	---	3
MLPC210	Clinical Biochemistry-II LAB			2	2		1	1
BS211	Environmental Science	2	--	--	2	2	--	2
	Total	14	---	16	30	14	8	22

PROGRAM THREE YEAR DIPLOMA IN MEDICAL LAB TECHNOLOGY	
Course Code: ES202	Course Title: Introduction to Computers and Information Technology
Semester: 2nd	Credit: 2
Periods Per Week: 4 (L: 0 T: 0 P: 4)	

(* Common to Architecture Assistantship, Automobile, Civil, Civil(PHE), QSCM, Computer, Electrical, E&C, Medical Electronics, Food Technology, Garment Technology, I&C, Leather Technology, Mechanical, Textile Design, Textile Technology, Travel and Tourism, MLT, Wood Technology and IT)

COURSE OBJECTIVE

Information technology has great influence on all aspects of our life. Primary purpose of using computer is to make the life easier. Almost all work places and living environment are being computerized. The subject introduces the fundamentals of computer system for using various hardware and software components. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; use of various tools of MS Office/Open Office using internet etc. form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

COURSE CONTENT

1. Basics of Information Technology

- 1.1. Its concept and scope, applications of IT, ethics and future with information technology.
- 1.2. Impact of computer and IT in society.
- 1.3. Computer application in office, book publishing, data analysis, accounting, investment, inventory control, graphics, air and railway ticket reservation, robotics, military, banks, Insurance financial transactions and many more.

2. Basic Components of Computer System

- 2.1. Block diagram of a computer System and Processing of Data.
- 2.2. Demonstration of computer system viz., Hardware, Software
- 2.3. Concept of Memory and its various types, Primary and secondary memories (RAM, ROM, Storage Devices etc).

3. Internet and its Applications

- 3.1. Introduction to Internet, its basic working.
- 3.2. Concept of Email, Social Media, Cloud Computing.
- 3.3. Basic ideas about IP Address, DNS, URL, Server, Web Browser, LAN etc.

4. Use of Various Basic Data Processing Softwares

4.1. Word Processing (Microsoft Word & Google Docs.)

- 4.1.1. File Management:
 - 4.1.1.1. Opening, creating and saving a document, locating files, copying contents in some different file(s).
- 4.1.2. Editing a document:
 - 4.1.2.1. Entering text, Cut, copy, paste using tool- bars
- 4.1.3. Formatting a document:
 - 4.1.3.1. Using different fonts, changing font size and colour, changing the appearance through bold/ italic/ underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
 - 4.1.3.2. Aligning of text in a document, justification of document, Inserting bullets and numbering
 - 4.1.3.3. Formatting paragraph, inserting page breaks and column breaks, line spacing
 - 4.1.3.4. Use of headers, footers: Inserting footnote, end note, use of comments
 - 4.1.3.5. Inserting date, time, special symbols, importing graphic images, drawing tools
- 4.1.4. Tables and Borders:
 - 4.1.4.1. Creating a table,
 - 4.1.4.2. Formatting cells,
 - 4.1.4.3. Use of different border styles, shading in tables,
 - 4.1.4.4. Merging of cells, partition of cells, inserting and deleting a row in a table
- 4.1.5. Print preview, zoom, page set up, printing options
- 4.1.6. Using Find, Replace options

4.2. Microsoft-Excel and Google Sheets

- 4.2.1. Introduction to Spreadsheet Application-Workbook and Worksheets
- 4.2.2. Working with data and formulas:
 - 4.2.2.1. Addition, subtraction, division, multiplication, percentage and autosum.
 - 4.2.2.2. Format data, create chart, printing chart, save worksheet, creating and formatting of charts and graphs

4.3. Presentation (Microsoft-PowerPoint and Google Slides)

- 4.3.1. Introduction to PowerPoint - How to start PowerPoint - Working environment: concept of toolbars, slide layout, templates etc. - Opening a new/existing presentation - Different views for viewing slides in a presentation: normal, slide sorter etc.
- 4.3.2. Addition, deletion and saving of slides.
- 4.3.3. Insertion of multimedia elements - Adding text boxes, importing pictures, movies and sound, tables and charts etc.
- 4.3.4. Formatting slides - Text formatting, changing slide layout, changing slide color scheme - Changing background, Applying design template.
- 4.3.5. Viewing the presentation using slide navigator

COURSE OUTCOME

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

- Identify the different hardware components and functional units of a Computer system.
- Explain basic concepts and working of internet.
- Create and format word documents by using different word processing software.
- Prepare the spread sheets and the presentation of data in different ways.
- Prepare power point presentations.

RECOMMENDED BOOKS:

1. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd- Jungpura, New Delhi
2. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
3. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
4. Basics of Information Technology, by Ishan Publications, Ambala
5. Information Technology for Management by Henery Lucas, 7th edition, Tata McGraw Hill Education Pvt Ltd, New Delhi

UNIT WISE TIME AND MARKSDISTRIBUTION

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	10
2	13	20
3	13	20
4	32	50
Total	64	100

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN MEDICAL LAB TECHNOLOGY	
Course code: MLPC201	Course Title: Clinical Pathology
Semester: 2ND	Credits: 02
Periods per Week: 2(L: 2 T: 0 P: 0)	

COURSE OBJECTIVE:

The students are imparted basic training of theoretical and practical aspects in the field of clinical Pathology. The students are made to learn the technique of collection of clinical samples and their processing along with recording of data. The student will also obtain the basic knowledge of routine Clinical pathology investigations which are performed in different Clinical conditions with clear understanding.

COURSE CONTENTS

- 1. Collection and preservation of samples for various investigations (04hrs)**
 - 1.1. Blood
 - 1.2. Urine
 - 1.3. Stool
 - 1.4. Sputum
 - 1.5. Other Body Fluids

- 2. Laboratory glass and plastic ware (02hrs)**
 - 2.1. Cleaning and care of laboratory glass and plastic ware
 - 2.2. Different cleaning agents (soaps, detergents, chromic acid)
 - 2.3. Methods of cleaning and storage

- 3. Urine Analysis (08hrs)**
 - 3.1. Composition of urine
 - 3.2. Physical examination
 - 3.3. Chemical examination
 - 3.4. Microscopic examination
 - 3.5. Urine for HCG (Pregnancy Test)

- 4. Stool Analysis (06hrs)**
 - 4.1. Collection/Transportation
 - 4.2. Chemical examination of stool
 - 4.3. Microscopic Examination (For Ova/Cyst)

- 5. Semen Analysis (02hrs)**
 - 5.1. Physical examination
 - 5.2. Chemical examination
 - 5.3. Microscopic examination

- 6. Biological Fluids (Routine analysis) (10hrs)**

- 6.1. CSF
- 6.2. Synovial fluid
- 6.3. Peritoneal fluid
- 6.4. Pleural fluid
- 6.5. Sputum for AFB

COURSE OUTCOME

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

- Collect, transport and preserve the various clinical samples for different investigations.
- Prepare the various cleaning agents
- Perform routine urine examination
- Perform routine Feces examination
- Perform physical and Microscopic examination of semen
- Process various biological fluids

RECOMMENDED BOOKS

1. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
2. District Laboratory Practice in Tropical Countries by Monica Chesbrough
3. Text Book of Medical Laboratory Technology by KL Mukherjee Vol I, II and III; Tata McGraw Hill Publishers, New Delhi
4. Medical Laboratory Science Theory and Practical by J Ochei and A Kolhatkar, Tata McGraw Hill Publishing Company Ltd., New Delhi 2000 Ed.
5. Parasitology by KD Chatterjee; Chatterjee Medical Publishers, Kolkatta
6. Pledical Parasitology by Arora & Arora

UNIT WISE TIME AND MARKS DISTRIBUTION

Topic No.	Time allotted(Hrs)	Marks allotted(%)
1	4	13
2	2	6
3	8	31
4	6	19
5	2	6
6	10	25
Total	32	100

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN MEDICAL LAB TECHNOLOGY

Course code: MLPC202	Course Title: Clinical Pathology Lab
Semester: 2ND	Credits: 02
Periods per Week: 4(L: 0 T: 0 P: 4)	

COURSE OBJECTIVE:

The students are imparted basic training of theoretical and practical aspects in the field of clinical Pathology. The students are made to learn the technique of collection of clinical samples and their processing along with recording of data. The student will also obtain the

basic knowledge of routine Clinical pathology investigations which are performed in different Clinical conditions with clear understanding.

LIST OF PRACTICALS

(64 hrs)

1. Collection of blood, urine and stool.
2. Cleaning of glassware/plastic ware
3. Chemical Analysis of urine (qualitative) for sugar, proteins, ketone bodies, bile pigments, bile salts and urobilinogen.
4. Microscopic examination of urinary sediments
5. Occult blood test for Urine and stool specimen
6. Microscopic examination of stool for ova and cyst
7. Semen Examination

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN MEDICAL LAB TECHNOLOGY	
Course code: MLPC203	Course Title: Anatomy and Physiology-II
Semester: 2ND	Credits: 02
Periods per Week: 2 (L: 2 T: 0 P: 0)	

COURSE OBJECTIVE:

After studying this subject, the students shall be able to understand various Systems of body and their physiological functions along with anatomical positions.

COURSE CONTENTS

1. **Nervous system** **(8 hrs)**
 - 1.1 Central nervous system (brain and spinal cord)
 - 1.2 Peripheral nervous system (cranial and spinal nerves)
 - 1.3 The sense organs (eye, ear, tongue and nose); structure and functions

2. **Muscular system** **(4 hrs)**
 - 2.1 Brief description of skeletal, smooth and cardiac muscles
 - 2.2 Muscle fatigue

3. **Circulatory system** **(8 hrs)**
 - 3.1 Composition and functions of blood
 - 3.2 Anatomy and physiology of Heart
 - 3.3 Circulation of blood, Cardiac Cycle and Conducting System of Heart
 - 3.4 The blood pressure
 - 3.5 Arteries and veins
 - 3.6 Lymph and lymphatic system

4. **Endocrine system** **(5 hrs)**
 - 4.1 Description of each endocrine gland its secretions and their effect on the body

5. **Reproductive System** **(7 hrs)**
 - 5.1 Male and female reproductive system
 - 5.2 The ovarian cycle and ovulation
 - 5.3 Fertilization

COURSE OUTCOME

After the completion of course, the student will be able to:

- Explain the various parts of Nervous system, its Anatomy and function.
- describe the Anatomy and functions of Muscular System
- list the organs of Circulatory System, and their anatomy & functions.

- Describe the functions of endocrine system and anatomy and functions of various Endocrine Glands.
- Explain the reproductive system both male and female, list the various parts of Reproductive system, their anatomy & functions.

RECOMMENDED BOOKS

1. Anatomy and Physiology by Pears; JP Brothers, New Delhi
2. Anatomy and Physiology by Sears; ELBS, London
3. Basic Anatomy and Physiology by N Muruges; Sathya Publishers, Madurai
4. Ross and Wilson Anatomy and Physiology by Anne Waugh and Kathleen JW Wilson; Churchill Living Stone; London

UNIT WISE TIME AND MARKS DISTRIBUTION

Topic No.	Time allotted(Hrs)	Marks allotted(%)
1	08	24
2	04	13
3	08	28
4	05	15
5	07	20
Total	32	100

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN MEDICAL LAB TECHNOLOGY	
Course code: MLPC204	Course Title: Anatomy and Physiology-II LAB
Semester: 2nd	Credits: 01
Periods per Week: 2 (L: 0 T: 0 P: 2)	

COURSE OBJECTIVE:

After studying this subject, the students shall be able to understand various Systems of body and their physiological functions along with anatomical positions.

LIST OF PRACTICALS**(32 Hrs)**

1. Prepare the stained blood film and microscopic study of blood cells.
2. Monitor blood pressure.
3. Demonstration of various parts of nervous, circulatory and reproductive system through models and charts.
4. Study of various parts of nervous system (brain and spinal cord) (demonstration from model)
5. Study of structure of eye and ear (demonstration from models)
6. Study of structural differences between skeletal, smooth and cardiac muscles (permanent mounts) through demonstration.
7. Study of various parts of circulatory system through demonstration.
8. Examination of stained blood film for blood cells
9. Estimation of blood pressure
10. Study of various parts of reproductive system (male and female demonstration from models and charts)

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN MEDICAL LAB TECHNOLOGY	
Course Code: MLPC205	Course Title: Clinical Microbiology-II
Semester: 2ND	Credits: 3
Periods per Week: 3(L: 3 T: 0 P: 0)	

COURSE OBJECTIVE:

The students undergoing training of medical laboratory technology learn the knowledge of basic morphology, staining, culture, biochemical characteristics and Identification of pathogenic bacteria and their Antimicrobial sensitivity. In addition they are also made aware about the infection, disease and Lab Diagnosis of infectious diseases.

COURSE CONTENTS

- 1. Bacteriology (10 hrs)**
 - 1.1. General characteristics and Identification of bacteria
 - 1.1.1. Culture/Colony characteristics
 - 1.1.2. Microscopic examination/staining
 - 1.1.3. Motility demonstration methods
 - 1.2. Biochemical tests
 - 1.2.1. Carbohydrate utilization tests (Glucose, Lactose, sucrose, Manitol)
 - 1.2.2. Catalase, Oxidase, Coagulase (Rapid Bio-chemicals)
 - 1.2.3. IMViC Reactions
- 2. Characteristics and identification of :- (22hrs)**
 - 2.1. Staphylococci
 - 2.2. Streptococci and pneumococci
 - 2.3. Enterobacteriaceae - I (E coli, Klebsiella, Enterobacter)
 - 2.4. Enterobacteriaceae – II (Salmonella, Shigella, Proteus).
 - 2.5. Pseudomonas
 - 2.6. Neisseria
 - 2.7. Mycobacterium tuberculosis
- 3. Bacterial pathogenicity (4 hrs)**
 - 3.1. Definition of pathogenicity, pathogenesis and virulence
 - 3.2. Sources of infection
 - 3.2.1. Mode of spread of infection
 - 3.2.2. Types of infection
- 4. Nosocomial infection (02hrs)**
 - 4.1. Introduction
 - 4.2. Source and control of nosocomial infection
- 5. Antibiotic sensitivity (02hrs)**
 - 5.1. Disc Diffusion method – principle, procedure and precautions.

6. Laboratory Diagnosis of Infectious Diseases (04hrs)

- 6.1. Urinary Tract Infection (UTI)
- 6.2. Enteric Fever
- 6.3. Wound Infections

7. Advancement /Automation in clinical microbiology (04hrs)

- 7.1. Automatic culture system (BacTec and MGIT)
- 7.2. Molecular Techniques
- 7.3. PCR with various modifications
- 7.4. CBNAAT (Gene Xpert)

COURSE OUTCOME

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

Unit-1

- Perform the various culture techniques and identification of the isolate.

Unit -2:

- Identify the various pathogenic bacteria by performing various types of tests.

Unit-3:

- Explain disease and infection, their mode of spread and prevention.

Unit-4:

- identify the source and control of nosocomial infection.
- Know the source and control of nosocomial infection with better knowledge.

Unit-5:

- Perform the antibiotic susceptibility test and interpret the results.

Unit-6:

- Process the samples for Lab Diagnosis of Various Infectious diseases with better understanding of their clinical importance.

Unit-7:

- Work on the latest advanced instruments/techniques.

INSTRUCTIONAL STRATEGY

The teacher should lay stress on general characteristics of bacteria, morphological features, and nomenclature of bacterial for common use. The students should be made familiar with common names of bacteria and stress on correct use of bacterial pronunciation and spellings. The students should be taught with illustrations/audio-visual aids.

RECOMMENDED BOOKS

1. Textbook of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
2. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
3. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth – Heinemann; Oxford

4. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
5. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill, New Delhi
6. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough; Cambridge University Press; UK
7. Text Book of Microbiology by Ananthanarayan and Paniker; Orient Longman, Hyderabad
8. Text book of Medical Microbiology by Cruickshank Vol. I
9. Textbook of Medical Microbiology by Greenwood, ELBS
10. Medical Laboratory Science by Jockie and Kolhatkar, Tata McGraw Hill.
11. Text book of Microbiology by A. Chakraborty

UNIT WISE TIME AND MARKS DISTRIBUTION

Topic No.	Time allotted (Hrs)	Marks allotted (%)
1	10	23
2	22	44
3	04	08
4	02	04
5	02	04
6	04	08
7.	04	09
Total	48	100

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN MEDICAL LAB TECHNOLOGY	
Course Code: MLPC206	Course Title: Clinical Microbiology-II LAB
Semester: 2ND	Credits: 1
Periods per Week: 2(L: 0 T: 0 P: 2)	

COURSE OBJECTIVE:

The students undergoing training of medical laboratory technology learn the knowledge of basic morphology, staining, culture, biochemical characteristics and Identification of pathogenic bacteria and their Antimicrobial sensitivity. In addition they are also made aware about the infection, disease and Lab Diagnosis of infectious diseases.

LIST OF PRACTICALS (32 Hrs)

1. Collection, transportation of clinical samples, processing including culture of following clinical samples for identification of pathogens – Urine, Stool, Sputum, Throat swabs, Pus and Pus swabs, Blood, Skin, Eye and Ear swabs and CSF.
2. Identification of pure bacterial cultures of common pathogens.
3. Antimicrobial susceptibility testing by Stokes disc diffusion method
4. Biochemical testing Catalase, Oxidase, Coagulase, Indole, MR, VP and Citrate (IMViC).
5. Carbohydrate utilization tests.

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN MEDICAL LAB TECHNOLOGY	
Course Code: MLPC207	Course Title: Clinical Hematology-II
Semester: 2ND	Credits: 2
Periods per Week: 2(L: 2 T: 0 P: 0)	

COURSE OBJECTIVE:

The training in hematology is imparted to enable the students to know the principle of tests, methodology of routine as well as advanced procedures being carried out in the laboratory by using routine as well as automatic instruments.

COURSE CONTENTS

- 1. Hemocytometry (8 hrs)**
 - 1.1. Various counting chambers
 - 1.2. Methods of counting of RBC, WBC and platelets
 - 1.3. Calculation and reference values.
 - 1.4. Errors involved in hemocytometry and means to minimize them
- 2. Differential leucocyte counting (DLC) (07 hrs)**
 - 2.1. Preparation and staining of blood film
 - 2.2. Performance of DLC
 - 2.3. Normal values and significance of DLC
- 3. Hemoglobinometry (6hrs)**
 - 3.1. Hemoglobin formation and function
 - 3.2. Types of hemoglobin
 - 3.3. Various methods of estimation with specific reference to cyanmethemoglobin method
- 4. Blood Cell Morphology (5 hrs)**
 - 4.1 Study of blood cell morphology in health and disease conditions (Peripheral blood film)
- 5. Erythrocyte sedimentation rate (ESR) and Packed cell volume (PCV) (4 hrs)**
 - 5.1 Introduction
 - 5.2 Various methods their merits and demerits
 - 5.3 Factors involved in ESR
 - 5.4 Interpretation of results
- 6. Automation in hematology (2 hrs)**
 - 6.1 Introduction and types

COURSE OUTCOME

After the completion of the course, the student will be able to :

Unit-1

- Perform complete blood cell counts with proper technical skills.

Unit -2

- Perform DLC and its interpretation

Unit-3

- Perform Hemoglobin by various methods.

Unit-4

- Comment on PBF after recognizing the various methods.

Unit-5

- Perform ESR and PCV test by various methods.

Unit-6

- Operate various automatic blood cell counters with their working principles.

RECOMMENDED BOOKS

1. Medical Laboratory Technology Vol. 1 by KL Mukherjee; Tata McGraw Hill Publishers, New Delhi
2. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth Heinemann, Oxford
3. Medical Laboratory Manual for Tropical Countries by Monica Cheesbrough; Cambridge University Press, UK
4. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
5. Practical Haematology by JV Decei; ELBS with Curchill Living Stone; UK
6. Medical Laboratory Science Theory and Practical by J Ochei and A Kolhatkar, Tata McGraw Hill Publishing Company Ltd., New Delhi 2000 Ed.

UNIT WISE TIME AND MARKS DISTRIBUTION

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	08	30
2	07	20
3	06	20
4	05	14
5	04	12
7	02	04
Total	32	100

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN MEDICAL LAB TECHNOLOGY	
Course Code: MLPC208	Course Title: Clinical Hematology-II-LAB
Semester: 2ND	Credits: 1
Periods per Week: 2(L: 0 T: 0 P: 2)	

COURSE OBJECTIVE:

The training in hematology is imparted to enable the students to know the principle of tests, methodology of routine as well as advanced procedures being carried out in the laboratory by using routine as well as automatic instruments.

LIST OF PRACTICALS**(32 Hrs)**

1. Preparation of peripheral blood film.
2. Preparation and standardization of stains (leishman and giemsa)
3. Preparation of thick and thin blood smear
4. Hemoglobin Estimation by Sahli's method and Cyanmethaemoglobin method
5. Counting of RBC, WBC and Platelets.
6. Study of morphology of normal RBC, WBC and Platelets with the help of stained slide
7. To study abnormal morphology of RBC,WBC and Platelets with the help of stained slide

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN MEDICAL LAB TECHNOLOGY	
Course Code: MLPC209	Course Title: Clinical Biochemistry-II
Semester: 2ND	Credits: 03
Periods per Week: 3 (L: 3 T: 0 P: 0)	

COURSE OBJECTIVE:

The students are imparted basic training of theoretical and practical aspects in the field of clinical biochemistry. The students are made to learn the techniques of collection of clinical samples and their processing along with recording of data. The student will also obtain the basic knowledge of chemistry and metabolism of various metabolites which are routinely estimated in different diseases so that a clear understanding of the different tests is obtained. The students are also given basic training in safety measures, quality control and automation.

COURSE CONTENTS

- 1. Serum Bilirubin (10 hrs)**
 - 1.1. Formation and excretion of bilirubin
 - 1.2. Formation of bile pigments
 - 1.3. Conjugated and unconjugated bilirubin
 - 1.4. Principle and procedures of serum bilirubin estimation (Direct & Indirect)
 - 1.5. Reference values
 - 1.6. Clinical importance
- 2. SGOT, SGPT, GGT and ALP (9 hrs)**
 - 2.1. Principle and procedures of estimation
 - 2.2. Reference values
 - 2.3. Clinical importance
- 3. Serum proteins (7 hrs)**
 - 3.1 Different methods of estimation including principles and procedures
 - 3.1 Reference values
 - 3.2 Clinical importance
- 4. Lipid Profile (15 hrs)**
 - 4.1. Formation of cholesterol
 - 4.2. High density and low density cholesterol
 - 4.3. Principles and procedures of estimation
 - 4.4. Reference value
 - 4.5. Clinical importance
 - 4.6. Triglycerides, principle and procedure of estimation
 - 4.7. Importance of various ratios of HDL, LDL and VLDL
- 5. Automation in Biochemistry (7 hrs)**
 - 5.1. Various types of Auto analyzers

COURSE OUTCOME

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

- Explain the formation and excretion of Bilirubin.
- Explain the principle and clinical importance of various liver enzyme tests
- Explain the principle and clinical importance of protein estimation
- Explain the principle of various methods of lipid estimation along with its clinical importance and procedure.
- Operate various types of analyzers along with the explanation of their working principles.

INSTRUCTIONAL STRATEGY

Teachers should lay emphasis on concepts and principles while covering the subject contents. In the practical work, the students should be given opportunity to do practical work individually but under supervision.

RECOMMENDED BOOKS

1. A Procedure Manual for Routine Diagnostic Tests Vol. I, II and III by KL Mukherjee; Tata McGraw Hill Publishers, New Delhi
2. Practical Clinical Biochemistry by H. Varley; Heinmann Publishers, Oxford
3. A Text Book of Medical Laboratory Technology by P Godkar; Bhalani Publishers, Mumbai
4. Medical Laboratory Science, Theory and Practice by J Ochaie and A Kolhatkar, Tata McGraw Hill

UNIT WISE TIME AND MARKS DISTRIBUTION

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	10	25
2	09	20
3	07	10
4	15	35
5	07	10
Total	48	100

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN MEDICAL LAB TECHNOLOGY	
Course Code: MLPC210	Course Title: Clinical Biochemistry-II LAB
Semester: 2ND	Credits: 01
Periods per Week: 2 (L: 0 T: 0 P: 2)	

COURSE OBJECTIVE:

The students are imparted basic training of theoretical and practical aspects in the field of clinical biochemistry. The students are made to learn the techniques of collection of clinical samples and their processing along with recording of data. The student will also obtain the basic knowledge of chemistry and metabolism of various metabolites which are routinely estimated in different diseases so that a clear understanding of the different tests is obtained. The students are also given basic training in safety measures, quality control and automation.

LIST OF PRACTICALS**(32 Hrs)**

1. Serum bilirubin estimation (Direct and Indirect)
2. SGOT estimation
3. SGPT estimation
4. ALP estimation
5. Total cholesterol estimation
6. Triglyceride estimation
7. Estimation of HDL and calculation of VLDL and LDL

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN MEDICAL LAB TECHNOLOGY	
Course Code: BS211	Course Title: ENVIRONMENTAL SCIENCE
Semester: 2nd	Credits: 2
Periods Per Week: 2(L: 2, T: 0, P:0)	

COURSE OBJECTIVE

The three main goals of environmental science are: to learn how the natural world works, to understand how humans interact with the environment, and to find ways to deal with environmental problems and live more sustainably.

COURSE CONTENT

1. Ecosystem

- 1.1 Structure of ecosystem, Biotic & Abiotic components
- 1.2 Food chain and food web
- 1.3 Aquatic (Lentic and Lotic) and terrestrial ecosystem
- 1.4 Carbon, Nitrogen, Sulphur, Phosphorus cycle.
- 1.5 Global warming -Causes, effects, process, Green House Effect, Ozone depletion

2. Air and Noise Pollution

- 2.1 Definition of pollution and pollutant, Natural and manmade sources of air pollution
- 2.2 Air Pollutants: Types, Particulate Pollutants: Effects and control
- 2.3 Gaseous Pollution Control: Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler
- 2.4 Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules.

3. Water and Soil Pollution

- 3.1 Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD: Definition, calculation
- 3.2 Waste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis)
- 3.3 Causes, Effects and Preventive measures of Soil Pollution: Causes-Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste.

4. Solid Waste Management, ISO 14000 and Environmental Management

- 4.1 Solid waste generation- Sources and characteristics of: Municipal solid waste, E-waste, biomedical waste.
- 4.2 Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries.
- 4.3 Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste
- 4.4 Air quality act 2004, air pollution control act 1981 and water pollution and control act 1996.
- 4.5 Structure and role of Central and state pollution control board.
- 4.6 Concept of Carbon Credit, Carbon Footprint.
- 4.7 ISO14000: Implementation in industries, Benefits.

COURSE OUTCOME

After completion of the course the student be able to:

- Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
- work and produce most efficient, economical and eco-friendly finished products.
- Solve various engineering problems applying ecosystem to produce eco – friendly products.
- Use relevant air and noise control method to solve domestic and industrial problems.
- Use relevant water and soil control method to solve domestic and industrial problems.
- Solve local solid and e-waste problems.

RECOMMENDED BOOKS

1. S.C. Sharma & M.P. Poonia, Environmental Studies, Khanna Publishing House, New Delhi
2. Arceivala, Soli Asolekar, Shyam, Waste Water Treatment for Pollution Control and Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099-
3. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000
4. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi

UNIT WISE TIME AND MARKS DISTRIBUTION

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	6	16
2	8	20
3	8	24
4	10	40
Total	32	100