

FACULTY OF SCIENCES

SYLLABUS FOR THE BATCH 2022-23

Programme Code: ZDMLS

**Programme Name: Certificate/Diploma in Medical Laboratory Science
(Semester I-II)**

Examinations: 2022-2023



Department of Zoology

Khalsa College, Amritsar

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| S. No. | PROGRAMME OBJECTIVES |
|--------|--------------------------------------------------------------------------------------------------------------------------------|
| 1. | To demonstrate various safety rules in laboratory; cleaning and sterilization of glass ware. |
| 2. | Understand laboratory apparatus and glassware; the preparation of chemical reagents and standards. |
| 3. | Study various filtration methods, types of microscopes, blood test and preservation of different clinical samples. |
| 4. | Study various blood and urine tests. |
| 5. | Understand various pathogenic microbes and diseases caused by them, their occurrence and eradication programs. |
| 6. | Understand the life history, mode of infection and pathogenicity and control measures of pathogenic protozoans and helminthes. |

| S.No. | PROGRAMME SPECIFIC OUTCOMES (PSOS) |
|-------|----------------------------------------------------------------------------------------------------------------------------------|
| PSO-1 | Have knowledge of various safety rules in laboratory; cleaning and sterilization of glass ware. |
| PSO-2 | Will be able to handle laboratory apparatus and glassware, chemical reagents, standards and equipment used in the pathology lab. |
| PSO-3 | Analyse various blood, urine & other materials for any disease/abnormality. |
| PSO-4 | Diagnose presence of various pathogens in a given sample. |
| PSO-5 | The knowledge of Lifecycle of pathogens & vectors will enable them to participate in various eradication programmes. |

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CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY SCIENCE

| COURSE SCHEME | | | | | | | |
|----------------------|------------------------------------|------------|------------|-----|----|-------|----------|
| SEMESTER - I | | | | | | | |
| Course Code | Course Name | Hours/Week | Max. Marks | | | | Page No. |
| | | | Th. | Pr. | IA | Total | |
| ZDMLS111 | Good Laboratory Practices | 4 | 37 | -- | 13 | 50 | 4 |
| ZDMLS112 | Medical Laboratory Instrumentation | 4 | 37 | -- | 13 | 50 | 5 |
| ZDMLS113 | GLP Practical | 4 | -- | 37 | 13 | 50 | 6 |
| ZDMLS114 | MLI Practical | 4 | -- | 37 | 13 | 50 | 7 |
| | | | | | | 200 | |

| SEMESTER - II | | | | | | | |
|----------------------|-------------------------------------|------------|------------|-----|----|-------|----------|
| Course Code | Course Name | Hours/Week | Max. Marks | | | | Page No. |
| | | | Th. | Pr. | IA | Total | |
| ZDMLS121 | Introduction to Pathogenic Diseases | 4 | 37 | -- | 13 | 50 | 8 |
| ZDMLS122 | Medical Diagnostic Techniques | 4 | 37 | -- | 13 | 50 | 10 |
| ZDMLS123 | IPD Practical | 4 | -- | 37 | 13 | 50 | 12 |
| ZDMLS124 | MDT Practical | 4 | -- | 37 | 13 | 50 | 13 |
| | | | | | | 200 | |

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CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY SCIENCE

Semester-I

Theory

COURSE CODE: ZDMLT111

COURSE TITLE: GOOD LABORATORY PRACTICES

Credit Hours: 4 hrs.

Total Hours: 60 hrs.

Theory Paper: 37

Internal assessment: 13

Total Marks: 50

Periods/week: 6

Time: 3 Hrs.

Instructions for the Paper Setters:

1. There will be a total of 9 questions of which five are to be attempted.
2. Question 1 will be compulsory (9 marks). There will be of 8 short answer type questions (1.5 mark each) of which 6 are to be attempted.
3. The remaining 8 questions shall include two questions from each unit. Candidates shall be required to attempt 4 questions, one from each unit. Each question carries 7 marks. Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

Course Objectives: The paper aims to

| | |
|----|------------------------------------------------------|
| 1. | Demonstrate various safety rules in laboratory. |
| 2. | Understand cleaning and sterilization of glass ware. |

UNIT-I

Laboratory Safety Rules: Laboratory Safety Rules, hazards and precautions during sample collections and laboratory investigations.

Laboratory Techniques: Laboratory Techniques like Calorimetry, Microscopy, Autoclaving, Centrifugation and Spectrophotometry

UNIT-II

Introduction to chemical analysis: Nature of analytical chemistry, general directions of chemical analysis: Cleanliness in the laboratory, Recording and planning data. Data quality: Bias, Precision, Uncertainty, Method detection limit, Checking correctness of analysis, Expression of results, Significant figures, Collection and preservation of sample,

UNIT-III

Laboratory hazards: Chemical, Fire, Careless habits, Handling of compressed gases, Stockroom safety rules, Laboratory safety rules. Quality assurance of chemical measurements: Quality assurance, quality control, Quality assessment,

UNIT-IV

Sampling: Sampling custody, Sample preparation, Analytical methodology with case studies, Calibrations, Detection limits, Statistics in chemical analysis, Quality control charts.

Suggested Readings:

1. Csuros, M., Environmental Sampling and Analysis, Lewis Publications.
2. Standard methods for the examination of water and wastewater, American Public Health Association, 19th ed., Washington D.C.

Course Outcomes

| | |
|-------|--------------------------------------------------------------------------------------------------------------|
| CO-1. | Students get to know about laboratory safety rules like proper handling of patients, specimens, needles etc. |
| CO-2. | Students get to know about laboratory hazards like chemical, fire etc. |

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY SCIENCE

Semester-I

Theory

COURSE CODE: ZDMLT112

COURSE TITLE: MEDICAL LABORATORY INSTRUMENTATION

Credit Hours: 4 hrs.

Total Hours: 60 hrs.

Theory Paper: 37

Internal assessment: 13

Total Marks: 50

Periods/week: 6

Time: 3 Hrs.

Instructions for the Paper Setters:

1. There will be a total of 9 questions of which five are to be attempted.
2. Question 1 will be compulsory (9 marks). There will be of 8 short answer type questions (1.5 mark each) of which 6 are to be attempted.
3. The remaining 8 questions shall include two questions from each unit. Candidates shall be required to attempt 4 questions, one from each unit. Each question carries 7 marks. Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

Course Objectives: The paper aims to

| | |
|----|-----------------------------------------------------------|
| 1. | Study various laboratory apparatus and glassware. |
| 2. | Study the preparation of chemical reagents and standards. |
| 3. | Study filtration methods. |

UNIT-I

Laboratory apparatus and glassware: Labware materials, soft vs. heat resistant glassware, plastic, porcelain, platinum, nickel labware. Volumetric flask, pipette, burette, cleaning of volumetric glassware. Types of balances: Analytical balances, Desiccators.

UNIT-II

Chemical reagents and standards: Grade and purity of chemicals, Proper storage of chemicals and standards, Laboratory pure water, Preparation of reagent grade water, Reagent water quality.

Reagents and solutions. Stock standardization solutions, Preparation and standardization of common standard solutions,

UNIT-III

Filtration: Gravity, Vacuum, Centrifugation, Distillation: Simple, Fractional, Vacuum, Refluxing, Ion exchange, Drying and ashing sample, Liquid liquid extraction by separating funnel, Soxhlet extraction.

UNIT-IV

Software skills: Software's for stock room management, Role of computers in Laboratory occupational health and safety, Waste minimization and disposal.

Suggested Readings:

1. Csuros, M., Environmental Sampling and Analysis, Lewis Publications.
2. Standard methods for the examination of water and wastewater, American Public Health Association, 19th ed., Washington D.C.

Course Outcomes

| | |
|-------|----------------------------------------------------------------------------|
| CO-1. | The students will get to know about various laboratory glasswares. |
| CO-2. | The students will get to know about chemical reagents and standards. |
| CO-3. | The students will get to know about different types of filtration methods. |

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY SCIENCE

Semester-I

COURSE CODE: ZDMLT113

COURSE TITLE: GLP PRACTICAL

Credit Hours: 4 hrs.

Total Hours: 60 hrs.

Practical Paper: 37

Internal assessment: 13

Total Marks: 50

Periods/week: 6

Time: 3 Hrs.

Important Note for Practical:

- A. Candidates will be required to submit their original note books containing record of their laboratory work.
- B. As per the latest UGC guidelines the dissections may please be avoided. In no case an animal falling under the categories of wildlife protection act 1972 should be caught or dissected. The rules of the Prevention of cruelty to Animals act 1960 should be familiar to all who are teaching the zoology courses. The guidelines on this issue are also available on the UGC website: www.ugc.ac.in

Course Objectives: The paper aims to

| | |
|----|------------------------------------------------------|
| 1. | Demonstrate various safety rules in laboratory. |
| 2. | Understand cleaning and sterilization of glass ware. |

Practical List

| | | |
|----|-------------------------------|-----------------------------------------------------------------------------------------------------------------|
| 1. | Demonstration of | Safety rules in laboratory like proper handling of patients, specimens and disposal of syringes, needles etc. |
| 2. | Use of | autoclave, centrifuge and spectrophotometer. |
| 3. | Cleaning and sterilization of | Glass ware using hot air oven, autoclave etc. |
| 4. | Laboratory hazards | Chemical, Fire, Careless habits, Handling of compressed gases, Stockroom safety rules, Laboratory safety rules. |
| 5. | Sampling | Sampling custody, Sample preparation |

Note: - Some changes can be made in the practical depending on the availability of material

Course Outcomes

| | |
|-------|-----------------------------------------------------------------|
| CO-1. | Students get to know about laboratory safety rules. |
| CO-2. | Understand proper handling of patients, specimens, needles etc. |

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY SCIENCE
Semester-I

COURSE CODE: ZDMLT114
COURSE TITLE: MLI PRACTICAL

Credit Hours: 4 hrs.

Total Hours: 60 hrs.

Practical Paper: 37

Internal assessment: 13

Total Marks: 50

Periods/week: 6

Time: 3 Hrs.

Important Note for Practical:

- Candidates will be required to submit their original note books containing record of their laboratory work.
- As per the latest UGC guidelines the dissections may please be avoided. In no case an animal falling under the categories of wildlife protection act 1972 should be caught or dissected. The rules of the Prevention of cruelty to Animals act 1960 should be familiar to all who are teaching the zoology courses. The guidelines on this issue are also available on the UGC website: www.ugc.ac.in

Course Objectives: The paper aims to

| | |
|----|----------------------------------------------------|
| 1. | Demonstrate various types of microscopes. |
| 2. | Understand preparation of chemicals and standards. |

Practical List

| | | |
|----|--------------------|------------------------------------------------------------------------------------------------------|
| 1. | Demonstration of | Different types of microscopes |
| 2. | Balances | Types of balances: Analytical balances, Desiccators |
| 3 | Storage techniques | Proper storage of chemicals and standards, Laboratory pure water, Preparation of reagent grade water |
| 4 | Preparation | Preparation and standardization of common standard solutions |
| 5 | Filtration | Gravity, Vacuum, Centrifugation, Distillation |
| 6 | Glassware | Types of glass slides, coverslips, test tubes, pipettes etc. |

Note: - Some changes can be made in the practical depending on the availability of material

Course Outcomes

| | |
|-------|-------------------------------------------------------------------------------------------|
| CO-1. | Students get to know about different types of microscopes. |
| CO-2. | Students will get technical knowhow regarding the preparation of chemicals and standards. |

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY SCIENCE

Semester-II

Theory

COURSE CODE: ZDMLT121

COURSE TITLE: INTRODUCTION TO PATHOGENIC DISEASES

Credit Hours: 4 hrs.

Total Hours: 60 hrs.

Theory Paper: 37

Internal assessment: 13

Total Marks: 50

Periods/week: 6

Time: 3 Hrs.

Instructions for the Paper Setters:

1. There will be a total of 9 questions of which five are to be attempted.
2. Question 1 will be compulsory (9 marks). There will be of 8 short answer type questions (1.5 marks each) of which 6 are to be attempted.
3. The remaining 8 questions shall include two questions from each unit. Candidates shall be required to attempt 4 questions, one from each unit. Each question carries 7 marks. Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

Course Objectives: The paper aims to

| | |
|----|----------------------------------------------------------------------------------------------------------------|
| 1. | Understand various pathogenic microbes and diseases caused by them, their occurrence and eradication programs. |
| 2. | Understand the life history, mode of infection and pathogenicity of pathogenic protozoans and helminthes. |
| 3. | Study the life cycle and control measures of arthropod vectors of human disease. |

UNIT-I

Introduction of Parasitology: (pertaining to various terminologies in use).

Brief introduction: of pathogenic Microbes (Viruses and Bacteria) & Helminthes.

UNIT-II

Epidemic diseases: Typhoid, Cholera, Giardia, Filariasis, Malaria, Dengue, their occurrence
Epidemic eradication programs

UNIT-III

Life cycle and control measures of arthropod vectors of following human diseases:
Malaria (*Anophelesstephensi*, *A. culicifacies*) Yellow fever, Dengue and Dengue haemorrhagic fever, Chikungunya, (*Aedes aegypti* *A. Albopictus*)

UNIT-IV

Life cycle and control measures of arthropod vectors of following human diseases:
Filariasis (*Culexpiensatigeans*) *Mansoni* sp. Japanese Encephalitis (*C. trinalorhynchus*);
Plague (*Stenophalidecheopsis*) and Epidemic Typhus (*Pediculus* spp).

Suggested Readings:

1. Baker, F.J. and Silvertan, R.E. (1985) Introduction to Medical Laboratory Technology (6th ed), Butlerworth and Co. Ltd.
2. Chatterjee, K.D.(1995), Parasitology, Protozoology and Helminthology (12thed).
3. Cheesborough, M.(1987), Medical Laboratory Technology for Tropical countries (2nded), Butlerworth and Co., Ltd.

KHALSA COLLEGE, AMRITSAR

(An Autonomous college)

P.G. DEPARTMENT OF ZOOLOGY

COURSE CODE: ZDMLS

SESSION: 2022-2023

4. Garcia, L.S.(2001), Diagnostic Medical Parasitology, (4thed), ASM Press Washington.
5. Kimball, J.W. (1986), Introduction of Immunology, MacMillian Publishing Co., New York.
6. Kuby, J.(2000), Immunology, W.H. Freeman & Co., USA.
7. Roitt, I. (1984), Essential Immunology, Blackwell Scientific Publications, Oxford.
8. Talib, V.H.(1999), Essential Laboratory Manual, Mehta Publishers, New Delhi.

Course Outcomes

| | |
|-------|---------------------------------------------------------------------------------------------------------------|
| CO-1. | Study of Pathogenic protozoans, helminthes, their pathogenicity, prophylaxis & treatment. |
| CO-2. | Learn about Pathogenic viruses, Rickettsiae, Spirochaetes, Bacteria etc. |
| CO-3. | Have insight into physiology, biochemistry, reproduction and control measures of insect vectors. |
| CO-4. | Know about epidemic diseases like influenza, chickenpox, small pox etc. their prevention and control measures |



CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY SCIENCE

Semester-II

Theory

COURSE CODE: ZDMLT122

COURSE TITLE: MEDICAL DIAGNOSTIC TECHNIQUES

Credit Hours: 4 hrs.

Total Hours: 60 hrs.

Theory Paper: 37

Internal assessment: 13

Total Marks: 50

Periods/week: 6

Time: 3 Hrs.

Instructions for the Paper Setters:

- 1) There will be a total of 9 questions of which five are to be attempted.
- 2) Question 1 will be compulsory (9 marks). There will be of 8 short answer type (1.5 mark each) of which 6 are to be attempted.
- 3) The remaining 8 questions shall include two questions from each unit. Candidates shall be required to attempt 4 questions, one from each unit. Each question carries 7 marks. Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

Course Objectives: The paper aims to

| | |
|----|-------------------------------------------------------------------------------------------------|
| 1. | Study the interaction between antigens and antibody. |
| 2. | Study various laboratory techniques. |
| 3. | Understand various blood test and preservation of different clinical samples. |
| 4. | Understand various parameters related to bacteriology. |
| 5. | Understand principle and significance of techniques related to histopathology and biochemistry. |

UNIT-I

Antigens and antibody interactions-Sero-diagnostic assays (Precipitation, agglutination immunodiffusion, ELISA, RIA).

Vaccines

UNIT-II

Collection, transportation and preservation of different clinical samples.

Haematology: Collection of blood (venous and capillary) anticoagulants (merits and demerits) Romanowsky's stains, total RBC count, erythrocyte sedimentation rate, TLC, DLC, platelet count

UNIT-III

Bacteriology: sterilization (dry heat, moist heat, autoclave, filtration), disinfection, staining techniques, (gram stain, AFB stain, etc), culture media (defined and synthetic media & routine laboratory media), bacterial culture (aerobic and anerobic) and antibiotic sensitivity.

UNIT-IV

Histopathology: Common fixatives and staining techniques

Biochemistry: Principle/ theory and significance of estimation of urea, sugar and cholesterol, creatinine, enzymes (serum transaminase, phosphatase, amylase and lipase), uric acid in blood; estimation of proteins, sugar, bile salts, ketone bodies in urine and liver function test.

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Suggested Readings:

1. Baker, F.J. and Silverton, R.E. (1985) Introduction to Medical Laboratory Technology, (6thed), Butlerworth and Co. Ltd.
2. Chatterjee, K.D.(1995), Parasitology, Protozoology and Helminthology (12thed).
3. Cheesborough, M.(1987), Medical Laboratory Technology for Tropical countries(2nded), Butlerworth and Co., Ltd.
4. Garcia, L.S.(2001), Diagnostic Medical Parasitology, (4thed), ASM Press Washington.
5. Kimball, J.W. (1986), Introduction of Immunology, MacMillian Publishing Co., New York.
6. Kuby, J.(2000), Immunology, W.H. Freeman & Co., USA.
7. Roitt, I. (1984), Essential Immunology, Blackwell Scientific Publications, Oxford.
8. Talib, V.H.(1999), Essential Laboratory Manual, Mehta Publishers, New Delhi.

Course Outcomes

| | |
|-------|-------------------------------------------------------------------------------------------------------------|
| CO-1. | Knowledge related to the techniques involved in detection of various diseases and its associated pathology. |
| CO-2. | Have practical skills of conducting basic clinical lab experiments. |
| CO-3. | Apply knowledge of clinical science and pathology to day to day life. |
| CO-4. | Understand impact of diseases and endo-parasites on human health |
| CO-5. | Learn about Physiology of Human Immune response. |



CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY SCIENCE
Semester-II

COURSE CODE: ZDMLT123
COURSE TITLE: IPD PRACTICAL

Credit Hours: 4 hrs.
Total Hours: 60 hrs.
Practical Paper: 37
Internal assessment: 13
Total Marks: 50

Periods/week: 6
Time: 3 Hrs.

Important Note for Practical:

- A. Candidates will be required to submit their original note books containing record of their laboratory work.
- B. As per the latest UGC guidelines the dissections may please be avoided. In no case an animal falling under the categories of wildlife protection act 1972 should be caught or dissected. The rules of the Prevention of cruelty to Animals act 1960 should be familiar to all who are teaching the zoology courses. The guidelines on this issue are also available on the UGC website: www.ugc.ac.in

Course Objectives: The paper aims to

| | |
|----|-----------------------------------------------------------------------------|
| 1. | Study permanent slides of parasitic protozoans, helminthes and arthropods. |
| 2. | Study the Preparation of blood smear showing different stages of plasmodium |

Practical List

| | |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Preparation of blood smear showing different stages of plasmodium |
| 2. | Study of permanent slides and specimens of parasitic protozoans, helminth and arthropods: Entamoeba, Giardia, Plasmodium, Trypanosoma, Leishmania, Trichomonae |
| 3 | Anopheles, culex (mouth parts), lice, rat flea, Aedes Aegypti, Tapeworm, Ascaris,. |

Note: - Some changes can be made in the practical depending on the availability of material

Course Outcomes

| | |
|-------|---------------------------------------------------------------------------------------------------------------------------------------|
| CO-1. | Students will be able to study the protozoans, parasitic helminthes , arthropods vectors of various diseases through permanent slides |
| CO-2. | Students will be able to examine stool for intestinal parasite |

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY SCIENCE
Semester-II

COURSE CODE: ZDMLT124
COURSE TITLE: MDT PRACTICAL

Credit Hours: 4 hrs.

Total Hours: 60 hrs.

Practical Paper: 37

Internal assessment: 13

Total Marks: 50

Periods/week: 6

Time: 3 Hrs.

Important Note for Practical:

- A. Candidates will be required to submit their original note books containing record of their laboratory work.
- B. As per the latest UGC guidelines the dissections may please be avoided. In no case an animal falling under the categories of wildlife protection act 1972 should be caught or dissected. The rules of the Prevention of cruelty to Animals act 1960 should be familiar to all who are teaching the zoology courses. The guidelines on this issue are also available on the UGC website: www.ugc.ac.in

Course Objectives: The paper aims to

| | |
|----|----------------------------------------------|
| 1. | Examine physicochemical properties of urine. |
| 2. | Study various blood tests. |

Practical List

| | | |
|---|-----------------------------------------------|------------------------------------------------------------------------------------------------------|
| 1 | Estimation of | ESR and hematocrit, Blood sugar and protein. |
| 2 | Physico-chemical examination of urine. | |
| 3 | Preparation of thick and thin blood smears. | |
| 4 | Counting of WBC, RBC and DLC. | |
| 5 | Analysis of blood groups, A, B, AB, O and Rh. | |
| 6 | Demonstration of various microtomy techniques | Fixation, embedding, cutting of tissue sections, and their staining (routine haemotoxylin and eosin) |

Note: - Some changes can be made in the practical depending on the availability of material

Course Outcomes

| | |
|-------|----------------------------------------------------------------------------------------------------------------------------|
| CO-1. | Students will get technical knowhow regarding estimation of Haemoglobin level, ESR, blood sugar, protein, cholesterol etc. |
| CO-2. | Students will be able to prepare thick and thin blood films and counting of WBC, RBC and DLC |
| CO-3. | Students will also perform physico-chemical examination of urine |

