

STUDY & EVALUATION SCHEME FOR CERTIFICATE PROGRAMME IN MEDICAL LAB. TECHNOLOGY

FIRST SEMESTER

Code	Units	Study Scheme Total Hrs.		Credits	Marks Evaluation Scheme								Total Marks
		Th	Pr		Internal Assessment			External Assessment					
					Th	Pr	Total	Th	Hrs	Pr	Hrs	Total	
CMLT1-101	Communication Skills	8	-	1	25	-	25	25	1	-	-	25	50
CMLT1-101P	Communication Skills Lab.	-	24	1	-	25	25	-	-	50	3	50	75
CMLT1-102	Basic Human Sciences	24	-	1	25	-	25	50	2	-	-	50	75
CMLT1-102P	Basic Human Sciences Lab.	-	64	2	-	50	50	-	-	100	4	100	150
CMLT1-103	Computer Applications	32	-	2	25	-	25	50	2	-	-	50	75
CMLT1-103P	Computer Applications Lab.	-	96	2	-	50	50	-	-	100	4	100	150
CMLT1-104	Clinical Pathology & Haematology	32	-	2	25	-	25	50	2	-	-	50	75
CMLT1-104P	Clinical Pathology & Haematology Lab.	-	124	4	-	75	75	-	-	100	4	100	175
CMLT1-105	Microbiology-I	16	-	2	25	-	25	50	2	-	-	50	75
CMLT1-105P	Microbiology-I Lab.	-	92	4	-	75	75	-	-	100	4	100	175
CMLT1-106P	#Student Centre Activity	-	48	2	-	25	25	-	-	-	-	-	25
CMLT1-107P	+ 4 – Week Training at the end of Semester	-	-	4	-	-	-	-	-	100	3	100	100
TOTAL		112	448	27	125	300	425	225	-	550	-	775	1200

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, energy conservation, environment, sports, hobby club, such as, photography, etc., seminars, declamation contest, educational field visits, NCC, NSS, cultural activities, etc.

+ Training

Before completion of the semester, the students will go for training in a relevant field organisation for a minimum period of 4 weeks and prepare a diary. The student will prepare a report at the end of training. This report will be evaluated by the concerned instructor in the presence of one organisation representative from the relevant trade/field.

Total weeks per semester: 16, Total working days per week: 5, Total hours per day: 7, Total hours in a semester: 16x5x7 = 560

One credit is defined as one hour of lecture per week or two hours of practical per week in the programme.

STUDY & EVALUATION SCHEME FOR CERTIFICATE PROGRAMME IN MEDICAL LAB. TECHNOLOGY

SECOND SEMESTER

Code	Units	Study Scheme Total Hrs.		Credits	Marks Evaluation Scheme								Total Marks
		Th	Pr		Internal Assessment			External Assessment					
					Th	Pr	Total	Th	Hrs	Pr	Hrs	Total	
CMLT1-208	Biochemistry	32	-	2	25	-	25	50	2	-	-	50	75
CMLT1-208P	Biochemistry Lab.	-	128	4	-	50	50	-	-	100	4	100	150
CMLT1-209	Microbiology-II	32	-	2	25	-	25	50	2	-	-	50	75
CMLT1-209P	Microbiology-II Lab.	-	128	4	-	50	50	-	-	100	4	100	150
CMLT1-210	Pathology	32	-	2	25	-	25	50	2	-	-	50	75
CMLT1-210P	Pathology Lab.	-	128	4	-	50	50	-	-	100	4	100	150
CMLT1-211P	#Student Centre Activity	-	48	2	-	25	25	-	-	-	-	-	25
CMLT1-212P	+ 4 – Week Training at the end of Semester	-	-	4	-	-	-	-	-	100	3	100	100
TOTAL		96	432	24	75	175	250	150	-	400	-	550	800

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, energy conservation, environment, sports, hobby club, such as, photography, etc., seminars, declamation contest, educational field visits, NCC, NSS, cultural activities, etc.

+ Training

Before completion of the semester, the students will go for training in a relevant field organisation for a minimum period of 4 weeks and prepare a diary. The student will prepare a report at the end of training. This report will be evaluated by the concerned instructor in the presence of one organisation representative from the relevant trade/field.

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COMMUNICATIVE ENGLISH

Subject Code: CMLT1-101

UNIT – I

Communication Skills: Basics, Understanding the communicative environment, what to listen for and why, when to speak and how, Starting and sustaining a conversation.

UNIT – II

Presentation Skills: Introduction; need of good presentation skills in professional life; preparing a good presentation; group discussion; extempore speaking. Multimedia presentation: Understanding the basics, Communication styles, Speaking in groups.

UNIT – III

Reading & Writing Skills: Importance of reading and writing, improving writing skills through understanding and practicing Notice, E-mail, Tenders, Advertisement, formal letter
Developing key traits: Creativity, critical thinking and problem solving, Motivation, persuasion, negotiation and leadership.

UNIT – IV

Essential and Vocational Skills: Survival strategies, managing time, Managing stress, Resilience, Work-life balance.

Interpersonal Communication: Individuals, groups and cultures, Building Relationships, Social Network, Media and Extending Our Identities.

BASIC HUMAN SCIENCES

Subject Code: CMLT1-102

Note – Paper will be divided into five units. Each unit will consist of one essay type and two short answer type questions. Students are required to attempt either essay type or two short answer type question from each unit. All unit carry equal marks.

UNIT – I

- A. Definitions Terminology of different parts, Structure of Cell and Tissues, General Anatomy of Tissues, bone, Joint, Nervous Tissue, Connective (Tissue, Lymph, Epithelial Tissue, Muscular Tissue).
- B. Anatomy of Upper Extremity - (a) Important region (Axilla, Cubital Fossa), (b) Important blood vessels, brachial Plexus and Nervous, (c) Important Muscles of upper Extremity, (d) Joints of upper Extremity in short.
- C. Anatomy of Lower Extremity - (a) Important Region femoral triangle, (b) and political fossa, (c) Important blood vessels, Nervous joints in short.

UNIT - II

- A. Thorax - (a) Structure of Heart, (b) Mediastinum, (c) Important big blood vessels (aorta, venacava, sublavian artery), (d) Structure in short of Trachea, Oesophagus, Bronchi, (e) Lungs.
- B. Abdomen - (a) In General structure of GI tract liver, spleen, pancreas, kidney, uterus urinary bladder, ovary testes, Biliary apparatus.
- C. Head, Neck and Face- (a) Formation of Trangle of the Neck, (b) Structure of gland (e.g. salivary gland, Thyroid gland, (c) Structure of Eye Ball, *Ear*, Nose and Tongue.
- D. Brain- (a) Structure of Spinal Cord, Brain, Brain stem, cerebellum and CSF.

UNIT - III

- A. General physiology of cell membrane and Tissues.
- B. Composition and function of various Body fluids - (a) Blood: Composition, function, RBC, WBC, Thrombocytes, coagulation of blood, (b) Lymph, composition and function,

(c) Function of Reticular system, (d) C.S.F. composition and function, (e) Anticoagulants and their uses.

- C. **Respiratory System** – (a) Mechanism of Respiration, (b) Composition of inspiratory, expiratory and alveolar air, (c) Exchange of gases, (d) Control of respiration in short,

UNIT - IV

- A. **Circulation system** - (a) General properties of Cardiac muscles, (b) Functional tissues of Heart. (c) Circulation of Heart, (d) Cardiac cycle, Blood pressure, cardiac output in short, (e) Different waves of ECG and their significant.
- B. **Excretory** - (a) Structure and function of Kidney and Nephron, (b) Formation of urine, (c) Composition of urine (normal), (d) Abdominal constituent of urine, (e) Function of skin.
- C. **Digestive system** - (a) Composition and functions of various digestive juices, (b) Digestion of food stuff in short, (c) Functions of Digestive organs in short (e.g. Liver, Stomach), (d) Formation of stool and composition of stool, (e) Vitamins: in short.

UNIT - V

- A. **Reproductive and Endocrine Glands** - (a) Hormones of pituitary, thyroid, para thyroid, IASE Pancreas, Testes, ovary, Supra-renal glands. **Nervous System** – (a) Structure of neuron, Nerve fiber and their properties in short. (b) Synapse and transmission of impulse through synapse, (c) Functions of Brain, cerebellum, (d) Neurotransmitters in short, (e) Special senses.

BASIC HUMAN SCIENCES LAB.

Subject Code: CMLT1-102P

Demonstration & Practical:

1. Muscles of the whole body.
2. Demonstration of organs in thorax and abdomen.
3. Demonstration of viscera in head, face and neck.
4. Demonstration of all the glands in the body.
5. Identification of bony prominences on inspection and palpation in the body, especially of extremities.
6. Points to palpate nerves and arteries.
7. Identification of prominent muscles.
8. Extra-ocular muscles and salient points about the eye ball.
9. Demonstration on Brain.
10. Haematology (Demonstration only)
11. Study of Graphs
 - a) Skeletal muscles- (i) Simple muscle twitch (ii) Effect of increasing strength on SMT. (iii) Effect of increasing load on SMT. (iv) Effect of free load & after load (Starting 'aw). (v) Effect of temperature. (vi) Effect of two successive stimuli. (vii) Effect of fatigue. (viii) Effect of multiple stimuli & tetanus
 - b) Cardiac muscles- (i) Simple myocardiogram. (ii) Effect of temperature on the myocardiogram. (iii) Effect of drugs. (iv) All of none law. (v) Staircase phenomenon.
12. Physiology Fitness- (i) Breath holding, (ii) Mercury column test,
 - a. Cardiac efficiency test – Harvard step test – Master step test
 - (i) Recording of arterial blood pressure – effects of change in posture & exercise on A.B.P.
 - (ii) Stethography – (a) Effect of deglutition. (b) Effect of voluntary hyperventilation (c) Effect of exercise.
 - (iii) Spirometry - Lung volumes and capacities.

- (iv) Mosso's finger ergography and bicycle ergography
- (v) Perimetry
- (vi) Clinical examination of (a) Respiratory system. (b) Cardiovascular system. (c) Central Nervous system. (d) Special senses.

COMPUTER APPLICATIONS

Subject Code: CMLT1-103

UNIT – I

Introduction to Computer

- a) History of development of computers
- b) Computer system concepts
- c) Characteristics
- d) Capabilities and limitations
- e) Generations of computers.
- f) Basic components of a computer system – Control Unit, ALU, I/ O Devices, memory – RAM, ROM, EPROM, PROM, Flash Memory and other types of memory.

UNIT – II

Storage Devices

- a) Storage fundamentals – Primary Vs Secondary
- b) Data Storage and Retrieval methods – Sequential, Direct and Index Sequential.
- c) Various Storage Devices – Magnetic Tape, Magnetic Disks, Cartridge Tape, Data Drives, Hard Disk Drives, Floppy (Winchester Disk), Disks, Optical Disks, CD, VCD, CD-R, CD-RW, Zip Drive, DVD, SVCD.

UNIT – III

Computer Software

- 1. Types of Software – System software, Application software, Utility Software, Demoware, Shareware, Freeware, Firmware, Free Software.
- 2. Operating Systems – Functions, Types – Batch Processing, Single User, Multi User, Multiprogramming,
- 3. Multi-Tasking.
- 4. Programming languages – Machine, Assembly, High Level, 4 GL.
- 5. Data representation in computers.
- 6. Number System of computers – Binary, Octal, Hexa Decimal – Representation & their conversion.
- 7. Coding System – ASCII, BCD, and EBCDIC etc.
- 8. Computer Viruses.

UNIT-IV

Windows

- 1. Windows concepts, features, windows structure, desktop, taskbar, start menu, my computer, Recycle Bin.
- 2. Windows Accessories – Calculator, Notepad, Paint, WordPad, Character map.
- 3. Windows Explorer – Creating folders and other Explorer facilities.
- 4. Entertainment – CD Player, DVD Player, Media Player, Sound Recorder, Volume Control.

COMPUTER APPLICATIONS LAB.

Subject Code: CMLT1-103P

MS Office

1. Microsoft Word
2. Microsoft Excel
3. Microsoft PowerPoint

CLINICAL PATHOLOGY AND HAEMATOLOGY

Subject Code: CMLT1-104

Note – Paper will be divided into five units. Each unit will consist of one essay type and two short answer type questions. Students are required to attempt either essay type or two short answer type question from each unit. All units carry equal marks.

UNIT - I

Clinical Pathology: Reception of patients, noting carefully the test advised, phlebotomy and aftercare of patients. The Microscope –different types, parts of microscope, cleaning & care. Examination of Urine –Formation of urine, Physical examination –Colour, transparency, pH and Sp gravity. Chemical examination - Protein, Sugar, Ketone bodies, Bile pigment/salt, Chyle, Blood. Microscopical examination – Cells (RBC, WBC, Epith), casts, crystals, Detection of micro albumin & 2 hours' urine protein estimation.

UNIT - II

Examinations of body fluids – CSF, Pleural, peritoneal & pericardial fluid, Bronchoalveolar lavage fluid, hydatid cyst fluid, Joint fluid
Examination of Semen –physical characters, count, motility, viability and morphology.
Transportation of different clinical materials to distant laboratories.
Basic concepts of Jaundice.

UNIT - III

Introduction to haematology and laboratory organization Lab safety and Instrumentation.
Formation of blood, Composition and functions of blood, Various anticoagulants, their uses, mode of action and their merits and demerits, Methods of determination of PCV, Calculation of different red cell indices (Haemogram).

UNIT - IV

Physiological variations in HB, PCV, TLC and platelets, drawing of peripheral blood smear, staining & stain preparation, Quality assurance in hematology. Basic concepts of anaemia, Leukemia and hemorrhagic disorder, Cytochemical Stain for diagnosis/differential diagnosis of leukemia.

CLINICAL PATHOLOGY AND HAEMATOLOGY LAB.

Subject Code: CMLT1-104P

1. Urine analysis Physical, Chemical, Microscopic, Microbiological.
2. Stool analysis Physical, Chemical, Microscopic, Microbiological.
3. Sputum analysis Physical, Chemical, Microscopic, Microbiological.
4. Semen analysis Physical, Chemical, Microscopic, Microbiological
5. Collection & preservation of blood for various haematological investigations.
6. Preparation of blood smear.
7. Total leukocyte counts and Differential leukocyte count.
8. Erythrocyte sedimentation rate.
9. Hb%

MICROBIOLOGY-I

Subject Code: CMLT1-105

Note – Paper will be divided into five units. Each unit will consist of one essay type and two short answer type questions. Students are required to attempt either essay type or two short answer type question from each unit. All unit carry equal marks.

UNIT - I

Introduction and brief history of microbiology, Safety measures in microbiology, General characteristics and classification of bacteria and fungi, Growth and nutrition of microbes.

UNIT - II

Principles and methods of sterilization, Uses and mode of action antiseptics and disinfectants, Preparation, uses and standardization of culture media, Principles of staining methods and preparation of reagents, Antibiotic sensitivity tests, Biochemical tests and interpretation.

UNIT - III

General characters and classification of protozoa of medical importance.

Morphology, life cycles and Laboratory diagnosis of intestinal Protozoan-Amoebic-Giardia, Malarial Parasite, Nematodes, Haem flagellates,

UNIT - IV

Culture techniques for protozoa, Helminths Hookworm round worm, E. histolytica.- Giardia –Leishmania.

Casoni's test and its interpretation, Examination and processing of cysticercosis cyst.

Laboratory processing, staining and examination of samples.

MICROBIOLOGY-I LAB.

Subject Code: CMLT1-105P

1. Autoclave –its structure, functioning, control and indicator
2. Staining
 - a) Simple staining - negative staining
 - b) Gram staining - Acid fast staining
3. Demonstration of Fungus in Laboratory

GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

The maximum marks for SCA should be 25. The marks may be distributed as follows:

- i) 5 marks for general behaviour and discipline
(by Principal or HOD in consultation with the instructor(s)/trainers)
- ii) 5 marks for attendance as per following
(by the instructors/ trainers of the department)
 - a) Up to 75% Nil
 - b) 75% to 80% 02 marks
 - c) 80% to 85% 03 marks
 - d) Above 85% 05 marks
- iii) 15 marks maximum for sports/ NCC/ NSS/ Cultural/ Co-curricular activities as per following:
(by In-charge of Sports/ Cultural/ NCC/ NSS/ Co-curricular activities)
15 marks - for National level participation or inter-university competition
10 marks - participation any two of the activities
05 marks - participation at the internal sports of the institute/college/university
Note: There should be no marks for attendance in the internal sessional of different subjects.

MRSPTU

**TRAINING – I (4 Weeks)
Subject Code: CMLT1-107P**

The purpose of training is to:

1. Develop understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the courses of study.
2. Develop confidence amongst the students through first-hand experience to enable them to use and apply institute based knowledge and skills to perform field activities.
3. Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Training of students during their one-year certificate programme. It is training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 1st Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one organization representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | |
|-------------------------------|-----|
| a) Punctuality and regularity | 20% |
| b) Industrial training report | 50% |
| c) Presentation and viva-voce | 30% |

**BIOCHEMISTRY
Subject Code: CMLT1-208**

Note – Paper will be divided into five units. Each unit will consist of one essay type and two short answer type questions. Students are required to attempt either essay type or two short answer type question from each unit. All unit carry equal marks.

UNIT - I

Introduction, properties and simple metabolism of carbohydrates, proteins and fat.
Introduction and general properties of Nucleic acids and Enzymes.

UNIT - II

Radio isotopes and their use in Biochemistry, mole, molar and normal solutions pH, buffer solutions, pH-measurement, Osmosis, dialysis, surface tension.
Collection and recording of biological specimens, separation of serum plasma preservation and disposal of biological samples material.

UNIT - III

Disposal of Laboratory waste,
Basic statistics (mean, SD, CV, normal distribution, probability) Normal or Reference range.
Volumetric analysis - Preparation of Standard acid and base solutions, chloride estimation.

UNIT - IV

Colorimetry, Spectrophotometry, Flame Photometry Atomic Absorption Spectroscopy,
Electrometric determination of Na⁺ and K⁺, chromatography, Electrophoresis.
Radioimmunoassay (RIA) and ELISA.

BIOCHEMISTRY LAB.

Subject Code: CMLT1-208P

1. Preparation of laboratory reagents and standard
2. solutions, storage of chemicals.
3. Urine analysis (qualitative) for physical and chemical constituents i.e. sugar, proteins, bile pigments, ketone bodies, porphobilinogen, faecal occult blood.
4. Principal of Assay procedures for biological material and estimation of kidney function
5. tests.
6. Principles and methods of estimation for serum Urea, Uric acid, Creatinine,
7. Cholesterol, Bilirubin.
8. Estimation of Essential electrolytes: Sodium, potassium, calcium, chloride and phosphorus etc.
9. Estimation of important enzymes.

MICROBIOLOGY-II

Subject Code: CMLT1-209

Unit-I

Identification of Bacteria:

Micrococci, Staphylococci, Streptococci, pneumococci, Corynebacteria, Escherichia, Klebsiella, Enterobacter, Proteus-providencia Salmonella, Shingella, Arizona, Citrobacter, Yersinia, Pseudomonas, Vibrio, Haemophilus, Mycoplasma, Rickettsia, Chlamydia, Tricragents.

Unit-II

Pathogenic and new-pathogenic Fungi:

Candida, Cryptococci, Dermatophytes, Sporotrichoums, Histoplasma, Blastomyces, Coccidioides, Para-coccidioides, Dematiaceous fungi, Mycetoma, Actinomyces, Nocardia and common laboratory contaminants. Biochemical tests used for identification of bacteria and fungi.

Unit-III

Diagnostic serological methods – Agglutination & Flocculation, Latex agglutination tests – to be performed by the students, Elisa testing & RIA – principles and demonstration and interpretation of results of -Widal Test, VDRL Test, Aldehyde Test, ASO Titre, Rheumatoid factor, C-reactive protein, HBsAg, Anti HCV, Anti HIV.

Bacterial Serology, Strep, H. Pylori, Mycoplasma, syphilis.

Unit-IV

Virology: General Characteristics of viruses physical, chemical and Biological Properties, Introduction to use of different laboratory instruments and their safety Precautions, Collections, handling, and storage of samples for viral diagnosis, Washing, cleaning and sterilization of Media and glassware in Virology, Principles of biosafety hoods use of pipettes, syringes and other virus contaminated instruments in the laboratory.

MICROBIOLOGY-II LAB.

Subject Code: CMLT1-209P

Demonstration of Staining Procedures:

Preparation of the following Stains and Demonstration of Viral Inclusion Bodies:

- a) Seller's stain for Negri body demonstration.
- b) Giemsa Stain for CMV and Herpes viral inclusions

Preparation of Reagents for serological Tests:

Phosphate buffered saline, Veronal buffered saline, Alsever's solution, Dextrose gelatine, Veronal buffer and Tris buffer.

Dilutions/Serial dilutions,

RA Test, RPR,

Strep Test,

WIDAL Test, VDRL Test,

Pregnancy Test & HIV Test

PATHOLOGY-II

Subject Code: CMLT1-210

Note – Paper will be divided into five units. Each unit will consist of one essay type and two short answer type questions. Students are required to attempt either essay type or two short answer type question from each unit. All unit carry equal marks.

UNIT - I

Basic concepts of different mammalian tissues and their histological structure. Different human organs and their gross and histological structure and functions.

Receiving of biopsy specimens at laboratory (Clinical notes/fixatives)

Fixation of tissue-different fixatives and their mode of action.

UNIT - II

Methods of decalcification.

Processing of tissues-protocol for manual & automated tissue processors, paraffin embedding & preparation of blocks, preparation of reagents, different techniques & application and frozen section/cryostat.

Use of Microtomes, selection and maintenance of knives, technique of section cutting & mounting on slides.

Staining of tissue sections, preparation of different stains, staining methods for Haematoxylin & Eosin, Reticulin, PAS, Van-Gieson, Massion's trichrome, Lipid & Mucin stains & Perl's stain.

UNIT - III

Preservation of specimens and mounting of museum specimens.

Preparation of cytosmear and H. & E, Papanicolaou & MGG staining of different body fluids

Fine Needle Aspiration cytology & exfoliative cytology & Buccal Smear examination

Cytochemistry & immunohistochemistry.

Cytospin and cell block preparation.

UNIT - IV

Blood Group (ABO & Rh) – methods of grouping & reverse grouping.

Basic blood banking procedures –collection of blood, anticoagulants used, cross matching, different screening tests including Coomb's Test for incomplete antibodies, preparation of different blood components for use and how to serve a requisition.

Preparation of red cell suspension, Blood transfusion & hazards.

PATHOLOGY-II LAB.

Subject Code: CMLT1-210P

Study of histological slides Simple squamous epithelium, Unstriated and striated muscle fibres, cardiac muscle fibres, T.S. of Bone, T.S. of artery, T.S. of Vein, Medullated nerve fibre, non-medullated nerve fibre, V.S. of Skin, T.S. of oesophagus, T.S. of Stomach, T.S. of

duodenum, T.S. of pancreas, T.S. of Liver, T.S. of spleen, T.S. of Lung, T.S. of Kidney, T.S. of Testes, T.S. of ovary .

TRAINING – I (4 Weeks)

Subject Code: CMLT1-212P

The check points to ensure selection of a good laboratory for training

Organization and Personnel
Equipment/Instrumentation
Testing Facilities Operation
Test and Control Articles
Verification of Performance Specifications
Records and Reports
Physical Facilities
Specimen Transport and Management
Personnel Safety
Laboratory Information Systems

MRSPTU