

**STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA**

**TEACHING AND EVALUATION SCHEME FOR 4<sup>th</sup> Semester (Branch Name)(wef 2019-20)**

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
<b>Theory</b>									
	Th.1	MICROBIOLOGY-I	4		-	20	80	3	100
	Th.2	BIOCHEMISTRY-I	4		-	20	80	3	100
	Th.3	HUMAN ANATOMY & PHYSIOLOGY	4		-	20	80	3	100
	Th.4	HEALTH EDUCATION	4			20	80	3	100
		<i>Total</i>	16			80	320	-	400
<b>Practical</b>									
	Pr.1	MICROBIOLOGY-I LAB	-	-	6	25	75		100
	Pr.2	BIOCHEMISTRY-I LAB	-	-	6	25	75		100
	Pr.3	HUMAN ANATOMY & PHYSIOLOGY LAB	-	-	6	25	75		100
	Pr.4	Technical Seminar			2	50			50
		Student Centered Activities(SCA)			3				
		<i>Total</i>	-	-	23	125	225	-	350
		<b>Grand Total</b>	<b>16</b>	<b>-</b>	<b>23</b>	<b>205</b>	<b>545</b>	<b>-</b>	<b>750</b>

Abbreviations: L-Lecturer, T-Tutorial, P-Practical . Each class is of minimum 55 minutes duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM etc. ,Seminar and SCA shall be conducted in a section.

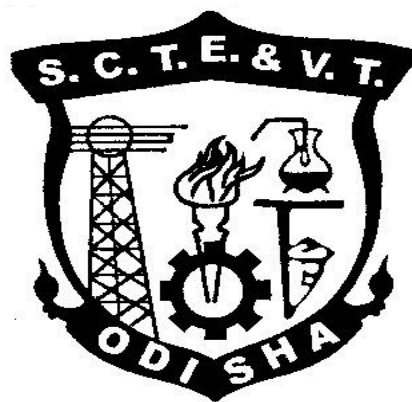
There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

# **CURRICULLUM OF 4<sup>TH</sup> SEMESTER**

**For**

## **DIPLOMA IN MEDICAL LAB TECHNOLOGY**

**(Effective FROM 2019-20 Sessions)**



**STATE COUNCIL FOR TECHNICAL  
EDUCATION & VOCATIONAL TRAINING,  
ODISHA, BHUBANESWAR**

## Th-1 MICROBIOLOGY-I

Name of the Course: MLT			
Course code:		Semester	4 <sup>th</sup>
Total Period:	60	Examination :	3 hrs
Theory periods:	4P / week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination ::	80

### A. RATIONALE:

The subject Microbiology is a compulsory paper for MLT. This subject includes General Bacteriology, Sterilization And Disinfection, Common Laboratory Equipments And Uses , Systemic Bacteriology , Clinical Microbiology And Mycology .

### B. OBJECTIVE:

On completion of study of Microbiology, the students will be able to:

1. Have an enhanced knowledge and appreciation of the General Bacteriology;
2. Be able to develop the general knowledge regarding the common Lab equipments;
3. Be able to perform, analyze and report on Mycology;
4. Be able to integrate related topics from separate parts of the course.

### C: Topic wise distribution of periods:

S.L. No.	Topics	
1	General Bacteriology	12
2	Sterilization And Disinfection	06
3	Common Laboratory Equipments And Uses	10
4	Systemic Bacteriology	08
5	Clinical Microbiology	12
6	Mycology	12
	<b>Total</b>	<b>60</b>

### D: COURSE CONTENTS

1. **GENERAL BACTERIOLOGY** : History of Microbiology, Microbes and their classification , Study of different , microscopes, Morphology of bacteria, Motional requirements of bacteria, Preparation and uses of culture media, Culture methods and identification of bacteria
2. **Sterilization and Disinfection** : Physical Chemical, Mechanical methods, Sterilization of media, syringe, glassware's etc., Safe disposal of contaminated media etc.
3. **Common Laboratory equipments and uses** : Different microscope, incubator, BOD incubator, Refrigerator, Deep Freeze, Hot air oven, Autoclave, Inspissator, Bacterial Filters, Water bath, VDRI rotation Centrifuge machine, Vacuum pump, media pouring chamber EUSA reader,etc

Anaerobic culture, Inoculation techniques, subculture and maintenance of stock culture. Isolation and identification of bacteria (Cultural characters biochemical reaction) serotyping etc. Antimicrobial susceptibility tests

4. **SYSTEMIC BACTERIOLOGY** : More importance should be given to culture methods and identification of bacteria that other properties like Pathogenesis etc.  
 Cocci - Staphylococci, streptococci, Pneumococci, Gonococci, Meningococci.  
 Bacilli – Corynebacterium, Bacillus, Clostridium, Nonsporing anaerobes, Enterobacteriaceae, E. Coll, Klebsiella, Salmonella, Shigella, Proteus, Vibrio- Pseudomonas, Mycobacterium (M. tuberculosis, M. Leprae), Basic idea on Actinocycetes, Rickettsiaae, - Spirochetes

**5. CLINICAL MICROBIOLOGY**

- Normal microbial flora of human body, Collection and transport of specimen
- Bacteremia, Pyaemia, Septicemia, Pyrexia of unknown origin (P.U.O)
- Meningitis, Food Poisoning, Respiratory Infection (Sore throat pneumonia, pulmonary Tuberculosis), Nosocomial Infections, Opportunistic Infection

**6. MYCOLOGY**

- Classification of pathogenic Fungi, Morphology of Fungi, Laboratory diagnosis of Fungi (KOH prep, Culture media and methods, LCB mount, etc.)
- Brief idea on Dermatophytes, Candida, Aspergillus, Cryptococcus and Opportunistic Fungi.

**Syllabus to be covered up to I.A.**

Chapter: 1,2,3 .

<b>Books recommended:</b>			
<b>Sl.No</b>	<b>Title of the Book</b>	<b>Name of Authors</b>	<b>Name of Publisher</b>
1.	Microbiology: An Introduction	Gerard J. Tortora, Berdell R. Funke And Christine L. Case	Pearson
2.	Textbook Of Microbiology	Ananthanarayan,R.	Orient Longman
3.	Essentials Of Microbiology	Bhatia,Rajesh	Jaypee Publisher

## Th-2 BIOCHEMISTRY-I

Name of the Course: MLT			
Course code:		Semester	4th
Total Period:	60	Examination :	3 hrs
Theory periods:	4P / week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination ::	80

### A. RATIONALE:

The subject BIOCHEMISTRY-I is a compulsory paper for MLT. This subject includes Carbohydrates, Fat and Proteins & Amino acid , Water soluble Vitamin & Fat soluble Vitamin, Plasma protein, Enzymes, Buffers, RSA, Overview of Iron, Nucleic Acids & Uric Acid.

### B: OBJECTIVES:

The primary mission of Biochemistry-I is to give knowledge about Chemistry of Carbohydrates, Fat and Proteins & Amino acid , Water & Fat soluble Vitamin, Plasma protein, Enzymes, Buffers, RSA, Overview of Iron, Nucleic Acids & Uric Acid.

### C: Topic wise distribution of periods:

S.L. No.	Topics	
S.L. No.	Topics	Periods
1	a) Carbohydrates b) Fat c) Proteins and amino acid	12
2	a) Water soluble Vitamin & Fat soluble Vitamin b) Plasma protein	07
3	Enzymes	03
4	a) Buffers b) Molarity c) indicators d) Radioisotopes e) Radiation hazard f) RSA	18
5	Overview of Iron, Calcium, Iodine, Flourine	10
6	Overview of Nucleic Acids & Uric Acid	10
	<b>Total</b>	<b>60</b>

- a) Carbohydrates including peptidoglycan  
b) Fat  
c) Proteins & Amino acid
- Water & Fat soluble Vitamin, Plasma protein.
- Enzymes (Classification, factors regulating, institution 2 clinical application)
- Buffers, Molarity, indicators, Radioisotopes, Radiation hazard, RSA.
- Overview of Iron, Calcium, Iodine, Flourine.
- Overview of Nucleic Acids & Uric Acid.

**Syllabus to be covered up to I.A.**

Chapter: 1,2,3.

<b>Books recommended:</b>			
<b>Sl.No</b>	<b>Title of the Book</b>	<b>Name of Authors</b>	<b>Name of Publisher</b>
1.	QUICK REVIEW ON BIOCHEMISTRY	L. AHUJA	C. B. S PUBLISHERS
2.	BIOCHEMISTRY	J.M.BERG	FREEMAN
3.	ESSENTIALS OF MEDICAL BIOCHEMISTRY	R.C. GUPTA	C. B. S PUBLISHERS

## Th-3 HUMAN ANATOMY & PHYSIOLOGY

Name of the Course: MLT			
Course code:		Semester	4 <sup>th</sup>
Total Period:	60	Examination :	3 hrs
Theory periods:	4P / week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination ::	80

### A. RATIONALE:

The subject Human Anatomy & Physiology is a compulsory paper for MLT. This subject includes Anatomy and physiology, Elementary tissues, Skeltal System, Cardiovascular System, Structure and functions of various parts of the heart , Respiratory system, Urinary system, Muscular System, Central Nervous System, Sensory Organs, Digestive System, Endocrine System and Reproductive System.

### B: OBJECTIVES:

The primary goal of the program is to educate residents to become knowledgeable anatomic and clinical pathologists who are self-motivated and competent to pursue either an academic or a private practice career in Pathology.

### C: Topic wise distribution of periods:

S.L. No.	Topics	Periods
1.	Scope of Anatomy and physiology	2
2.	Elementary tissues	2
3.	Skeltal System	10
4.	Cardiovascular System	4
5.	Structure and functions of various parts of the heart	2
6.	Respiratory system	2
7.	Urinary System	4
8.	Physiology of urine formation	2
9.	Muscular System	6
10.	Nervous System	6
11.	Sensory Organs	6
12.	Digestive System	6
13.	Endocrine System	4
14.	Reproductive system	4
	<b>Total</b>	<b>60</b>

1. Scope of Anatomy and physiology. Definition of various terms used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.
2. Elementary tissues: Elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue.
3. Skeltal System: Structure and function of Skelton .Classification of joints and their function. Joint disorders.

4. Cardiovascular System: Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood. Name and functions of lymph glands.
5. Structure and functions of various parts of the heart .Arterial and venous system with special reference to the names and positions of main arteries and veins. Blood pressure and its recording. Brief information about cardiovascular disorders.
6. Respiratory system: Various parts of respiratory system and their functions, physiology of respiration.
7. Urinary System: Various parts of urinary system and their functions, structure and functions of kidney.
8. Physiology of urine formation. Patho-physiology of renal diseases and edema.
9. Muscular System: Structure of skeletal muscle, physiology of muscle contraction. Names, positions, attachments and functions of various skeletal muscles. physiology of neuromuscular junction.
10. Central Nervous System: Various parts of central nervous system, brain and its parts, functions and reflex action. Anatomy and physiology of automatic nervous system.
11. Sensory Organs: Elementary knowledge of structure and functions of the organs of taste, smell, ear, eye and skin. Physiology of pain.
12. Digestive System: names of various parts of digestive system and their functions. structure and functions of liver, physiology of digestion and absorption.
13. Endocrine System: Endocrine glands and Hormones. Location of glands, their hormones and functions. pituitary, thyroid. Adrenal and pancreas
14. Reproductive system: Physiology and Anatomy of Reproductive system.

**Syllabus to be covered up to I.A.**

Chapter: 1 to 8.

<b>Books recommended:</b>			
<b>Sl.No</b>	<b>Title of the Book</b>	<b>Name of Authors</b>	<b>Name of Publisher</b>
1.	Fundamental Of Human Anatomy	N. Chakraborty	Central Book Agency
2.	Aranand`S Human Anatomy	Anand, Mahindra Kumar	Arora Medical Book Distribution
3.	Head & Neck Anatomy A Clinical Reference	Berkovitz,B.K.B	Dunitz



## Th-4 HEALTH EDUCATION

Name of the Course: MLT			
Course code:		Semester	4 <sup>th</sup>
Total Period:	60	Examination :	3 hrs
Theory periods:	4P / week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination ::	80

### A. RATIONALE:

The subject Health Education is a compulsory paper for MLT. This subject includes health and Nutrition , First aid, Environment , Communicable diseases, Epidemiology , Immunity and immunization

### B: OBJECTIVES:

The main objective of this course is to introduce student to basic biomedical instrumentation . As a result student can understand Concept of health, Nutrition and health, First aid, Communicable diseases and Non-communicable diseases & Immunity and immunization.

### C: Topic wise distribution of periods:

S.L. No.	Topics	Periods
1.	Concept of health	2
2.	Nutrition and health	2
3.	Demography and family planning	12
4.	First aid	12
5.	Environment and health	5
6.	Fundamental principles of microbiology	10
7.	Communicable diseases and Non-communicable diseases	10
8.	Epidemiology	3
9.	Immunity and immunization	4
	<b>Total</b>	<b>60</b>

1. Concept of health: Definition of physical health, mental health, social health, spiritual health determinants of health, indicatory of health, concept of disease, natural history of diseases, the disease agents, concept of prevention of diseases.
2. Nutrition and health: Classification of foods, requirements, diseases induced due to deficiency of proteins, vitamins and minerals-treatment and prevention.
3. Demography and family planning: Demography cycle, fertility, family planning, contraceptive methods, behavioral methods, natural family planning methods, chemical methods, mechanical methods, hormonal contraceptives, population problem of India.
4. First aid: Emergency treatment in shock, snake-bite, burns, poisoning, heart disease, fractures and resuscitation methods, Elements of minor surgery and dressings.
5. Environment and health: Source of water supply, water pollution, purification of water, health and air, noise, light-solid waste disposal and control-medical entomology, arthropod borne diseases and their control. rodents, animals and diseases.
6. Fundamental principles of microbiology: Classification of microbes, isolation, staining techniques of organisms of common diseases.
7. A) Communicable diseases: Causative agents, mode of transmission and prevention. Respiratory infections chicken pox, measles, influenza, diphtheria, whooping cough and tuberculosis. Intestinal infection-poliomyelitis, Hepatitis, cholera, Typhoid, food poisoning, Hookworm infection.

Arthropod borne infections-plague, Malaria, filariases.

Surface infection-Rabies, Trachoma, Tetanus, Leprosy. Sexually transmitted diseases-Syphilis, Gonorrhoea, AIDS.

B) Non-communicable diseases: causative agents, prevention, care and control.

8. Epidemiology: Its scope, methods, uses, dynamics of disease transmission.
9. Immunity and immunization: Immunological products and their dose schedule. Principles of disease control and prevention, hospital acquired infection, prevention and control. Disinfection, types of disinfection procedures, for-faces, urine, sputum, room linen, dead-bodies, instruments.

**Syllabus to be covered up to I.A.**

Chapter: 1 , 2 ,3, 4.

<b>Books recommended:</b>			
<b>Sl.No</b>	<b>Title of the Book</b>	<b>Name of Authors</b>	<b>Name of Publisher</b>
1.	Physical and Health Education	I.Rajgopal	Createspace Independent Pub
2.	Health education and health promotion	Maria A. Koelen, Anne W. Van den Ban	Wageningen Academic Publishers

## Pr-1 MICROBIOLOGY-I LAB

Name of the Course: MLT			
Course code:		Semester	4 <sup>th</sup>
Total Period:	90	Examination :	3 hrs
Lab. periods:	6 P / week	Sessional:	25
Maximum marks:	100	End Semester Examination ::	75

### A. RATIONALE:

The response of Microbiology can be verified practically by applying different theorems and fundamental techniques. The students will become sure that the theoretical tricks which they have learned from books are true. The students will become competent in the field of Microbiological Studies.

### B. OBJECTIVE:

Microbiology **practical** lessons are important in order to understand Microbiological concepts. If science education **aims** to enhance the understanding of the natural world by students and how it functions, then the students have to experience and observe the relevant science phenomena.

### C. Course content in terms of specific objectives:

1. Safety measures in the laboratory
2. First Aid in Laboratory accidents and general precaution- any measures.
3. Handling and care of microscopes.
4. Operation and maintenance of laboratory equipments
5. Anaerobic jar and other methods of anaerobic culture
6. Care and cleaning of all glassware (test tubes, slides petridishes pipettes, beakers, Rashes, funnels, syringes etc)
7. Collection & transport of clinical specimens  
(Blood CSF Urine, Stool, Bone marrow, Sputum, Swabs, Aspiration fluid etc).
8. Receipts, Labeling, recording and dispatching clinical specimens.
9. Keeping records after final computerization.
10. Conversant with S.I. unit system for reporting.
11. Conversant with Fundamental Chemistry, I.e. use of indicators
12. strength of a solution, percent solution, part-dilution, molar solution, normal solutions etc.
13. Various staining technique:- Simple stain, Gram's stain, Z.N. stain, Albert's stain, Negative stain, Spore stain, Neisser's stain, Lactophenol cotton blue staining for fungi, Leishman stain, Geimsa stain, Other special stain.
14. Wet preparations :Hanging drop preparation, KoH preparation for fungi, Vaginal fluid examination, -Isolation of bacteria in pure culture and Antibiotic sensitivity., -Identification of common bacteria by studying their morphology, cultural character, Biochemical reactions, slide agglutination and other tests., Maintenance and preservation of stock culture. , Study of fungi by wet preparation, staining, culture etc.
15. Approach to various clinical syndromes : Collection transport and processing of various clinical specimens , i.e. blood, CSF urine swabs faeces, etc. For microbiological diagnosis.,

Investigation of various common epidemics , Gastroenteritis, Cholera, Food poisoning, Meningitis ,  
Encephalitis, P.U.O., Study of nosocomial infection.

## Pr-2 BIOCHEMISTRY-I LAB

Name of the Course: MLT			
Course code:		Semester	4 <sup>th</sup>
Total Period:	60	Examination :	3 hrs
Lab. periods:	4 P / week	Sessional:	25
Maximum marks:	100	End Semester Examination ::	75

### A. RATIONALE:

The response of Biochemistry Lab can give practical knowledge about Laboratory safety record maintenance and Physiological Urine etc.

### B. OBJECTIVE:

Biochemistry is one of the services provided by Technicians in an attempt to promote Tests for Carbohydrate, Proteins & Amino Acids and Iron, Calcium, Iodine, Flourine, etc .

### C. Course content in terms of specific objectives:

1. Laboratory safety, Glass ware cleaning.
2. Pipettes, record maintenance.
3. Tests for Carbohydrate.
4. Tests for Proteins & Amino Acids.
5. Tests for Iron, Calcium, Iodine, Flourine, etc
6. Physiological Urine.

## Pr-3 HUMAN ANATOMY & PHYSIOLOGY LAB

Name of the Course: MLT			
Course code:		Semester	3 <sup>rd</sup>
Total Period:	90	Examination :	3 hrs
Lab. periods:	6 P / week	Sessional:	25
Maximum marks:	100	End Semester Examination ::	75

### 1. RATIONALE:

The response of Human Anatomy & Physiology Lab can give practical knowledge about Human Skelton, Digestive system , Respiratory system, Eye, Ear, Cardiovascular system, Urinary system, Reproductive system, Microscopic examination of epithelial tissue, cardiac muscle, smooth muscle, skeletal muscle, Connective tissue and nervous tissues, blood films for TLC. DLC and malarial Parasite, RBCs, clotting time of blood, erythrocyte sedimentation rate and Hemoglobin value, Recording of body temperature, pulse, heart-rate, blood pressure and ECG.

### 2. OBJECTIVE:

Human Anatomy & Physiology is one of the services provided by Technicians in an attempt to promote the vast knowledge about different parts and systems of human Body.

#### Course content in terms of specific objectives:

1. Study of the human Skelton.
2. Study with the help of charts and models of the following system and organs:  
Digestive system, Respiratory system, Eye, Ear, Cardiovascular system,  
Urinary system, Reproductive system .
3. Microscopic examination of epithelial tissue, cardiac muscle, smooth muscle, skeletal muscle. Connective tissue and nervous tissues.
4. Examination of blood films for TLC.DLC and malarial parasite.
5. Determination of RBCs, clotting time of blood, erythrocyte sedimentation rate and Hemoglobin value.
6. Recording of body temperature, pulse, heart-rate, blood pressure and ECG.

## **Pr.4 -TECHNICAL SEMINAR**

Practical : 2 Periods per week  
Total Periods : 30 Periods

Sessional : 50 Marks  
TOTAL MARKS : 50 Marks

Each student has to select a recent topic of latest technology in the area of MLT and present a seminar in front of all students of the class. He/She has to prepare a PowerPoint presentation of the selected topic of minimum 10 slides and the total presentation will be approximately 10 minutes duration. There will be an interactive session between the presenter and the rest of the students including the faculty members of the dept at the end of presentation. A student has to present at least 2 nos. of seminar during a semester and to submit the report for evaluation.

## List of Equipments for a batch size thirty

Sl. No.	Equipment	Quantity
1	Test tube	30
2	Folin-Wu tube	30
3	Glass slide mycole and cover slips	30
4	Petri dish	30
5	Glass beaker	20
6	Glass flask	20
7	Pasteur pipette	30
8	Graduated pipettes	30
9	Syringes	30
10	Disposable gloves	30
11	Tourniquet	15
12	Microscope	15
13	Bunsen burner or spirit lamps or candles	30
14	Centrifuge Machine	10
15	Electrophoresis apparatus	10
16	Chromatography:	10
17	Autoclave	30
18	Hematology analyzer	10
19	Hot Air Oven	5
20	Setup for radioimmunoassay or RIA	30



21	Setup for enzyme linked immunosorbant assay (ELISA)	10
22	Colorimeter	5
23	Burette	30
24	General laboratory stands, racks, filter paper, reagents, etc.	30each