WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION

Proposed Syllabus for the Diploma in Medical Laboratory Technology

Part - III

(5th Semester)

[Modification of curriculum structure & syllabus of part-II and part- III of Diploma in Engineering Course]

March'2014

1. CLINICAL MICROBIOLOGY

Course: Diploma in Medical Laboratory Technology Subject of Study: **Clinical Microbiology** Subject Code: MLT 501 Subject Offered in : **DMLT Part-III 5th Semester** Contact Periods: 3 L/ Week Subject: **Theoretical** Duration: **17 weeks**	**Credit: 3** Evaluation Scheme: Internal: TA: 10 + CT: 20 — 30 ESE — 70 **Total Marks** — **100**

AIM:

1. To acquire the basic knowledge of the bacteria, virus, parasite & helminthes
2. To acquire the basic knowledge different culture media
3. To acquire the basic knowledge of different staining
4. To acquire the basic knowledge diagnostic Microbiology

TEACHING SCHEME			
Teaching	15 weeks	45 Periods	45 Hrs
Internal Assessment	2 weeks	6 Periods	6Hrs
Total Contact Periods:	17 weeks	51 Periods	51 Hrs

END SEMESTER EXAMINATION SCHEME							
Sl. No	Questions	Group	From Unit	To be Set	To be Answered	Allotted Marks	Total Marks
1. a. b. c.	**Objective Questions** MCQ Fill in the blanks True/False		1 to 7	 10 8 8	 8 6 6	 1 x 8 1 x 6 1 x 6	**20**
2. to 11	**Subjective Questions** (May have Part Marking)	A B C	1, 2, 3, 4, 5, 6 7	3 4 3	**Any 5** at least Taking **one** From each Group	10 x 5	**50**
Grand Total							70

DETAIL SUBJECT CONTENT		
Unit	**Topic**	**Contact Periods**
1	**General Bacteriology:** Microbiology, Branches of microbiology, Scope of microbiology, Introduction to bacteria, size, shape, bacterial anatomy, Structure of cell wall, Gram negative and gram positive cell wall, difference between Gram negative and gram positive cell wall, spores. Study of morphology of bacteria, staining of bacteria – gram's stain, albert stain, ziehl-neelsen stain, spore stain, Growth requirements – Nutritional, gas, moisture, accessory nutritional requirement, Growth curve, factors influencing growth, Bacterial reproduction, Different Culture Media for bacterial growth, culture techniques, Classification and identification of bacteria	8
2	**Sterilization and disinfection:** Introduction to sterilization, disinfection, antiseptic, bacteriocidal agents, bacteriostatic agents; Different methods of sterilization-Physical, Chemical, dry heat, moist heat, Filtration, Radiation, Autoclave, types of autoclave, Commonly employed sterilization method for different clinical article , Uses of disinfectant; Infection, classification of infection, source of infection in man, Method of transmission of infection, Pathogenecity and Virulence	3
3	**General Virology:** Morphology of virus – size, shape, structure, Reaction to physical and chemical agents, Viral Multiplication, classification of viruses, Overview of oncogenic viruses, DNA viruses , RNA Viruses	5
4	**Mycology:** Fungi and yeasts, classification of Fungi , Superficial Mycosis, Microsporum, Trichophyton, Epidermophytom, Subcutaneous Mycosis	5
5	**Parasitology:** Introduction, Classification of parasite, host, Mechanism of disease production by parasites, classification of the pathogenic Protozoa, overview of Entamoeba histolytica, Giardia lamblia, Leishmania donovani Malaria parasite, Balantidium coli, kala-azar	7

6	**Helminthology:** Habitat, morphology , lifecycle of Whipworm, Roundworm, Hookworm, Threadworm, Wuchereria Bancrofti Taenia saginata, Taenia Solium	7
7	**Diagnostic Microbiology:** Specimen collection and handling, Containers, Transportation of specimen, Disposal of specimen after laboratory use, Microscopic Examination , Gram staining, Acid-fast staining, Laboratory Culture – culture media, preparation of culture media, pH adjustment of culture media, Making of culture plates, techniques of aseptic transfer, collection of blood for culture,laboratory diagnosis of Throat swab, Sputum Specimens, purulent exudates, Tuberculosis, Faecal specimen, Vibrio infections and cholera, Gonorrhea, Leprosy	10
TOTAL		45

REFERENCE BOOKS			
Sl. No	Books	Author	Publisher
1	Medical Microbiology	Satish Gupta	JP
2	Medical Laboratory technology (Vol. - II)	K L Mukherjee	Mc Graw Hill
3	Practical Microbiology Protozoology and Parasitological	N C Dey , T K Dey	New Central Book Agency
4	Medical Microbiology	N C Dey, H L E Grueber, T K Dey	
5	Medical Parasitology & clinical Pathology	S K Sarkar	
6	Microbiology	Michael J Pelezar	

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2. BIOMEDICAL INSTRUMENTATION-III

Course: Diploma in Medical Laboratory Technology Subject of Study: **Biomedical Instrumentation-III** Subject Code: MLT 502 Subject Offered in : **DMLT, Part-III, 5th Semester** Contact Periods: 3 L / Week Subject: **Theoretical** Duration: **17 weeks**	**Credit: 3** Evaluation Scheme: Internal: TA: 10 + CT: 20 — 30 ESE — 70 **Total Marks — 100**

AIM:

1. To understand the basic concept of Different therapeutic Instruments.
2. To acquire the basic knowledge of the Medical imaging instruments
3. To acquire the basic knowledge of Patient Monitoring system in ICU

TEACHING SCHEME			
Teaching	15 weeks	45 Periods	45 Hrs
Internal Assessment	2 weeks	6 Periods	6 Hrs
Total Contact Periods:	17 weeks	51 Periods	51 Hrs

END SEMESTER EXAMINATION SCHEME							
Sl. No	Questions	Group	From Unit	To be Set	To be Answered	Allotted Marks	Total Marks
1. a. b. c.	**Objective Questions** MCQ Fill in the blanks True/False		1 to 10	10 8 8	8 6 6	1 x 8 1 x 6 1 x 6	**20**
2. to 11	**Subjective Questions** (May have Part Marking)	A B C	1, 2, 3 4, 5, 6 7, 8, 9, 10	3 3 4	**Any 5** at least Taking **one** From each Group	10 x 5	**50**
Grand Total							70

DETAIL SUBJECT CONTENT		
Unit	**Topic**	**Contact Periods**
1	**Cardiac pacemaker:** Natural Pacemaker, Cardiac Pace Maker, Need of Pacemaker, Basic functional parts of cardiac pacemaker and their functions, Different Types- External, Implantable Pacemaker, Electrodes of Pacemaker, Synchronous and asynchronous Pacemaker,	4
2	**Defibrillators:** Fibrillation, Defibrillator, Different types of defibrillator, D.C. defibrillator – Basic principle of DC defibrillator, Basic block diagram of DC Defibrillator, Defibrillator electrodes, Different output waveforms, Pacer-cardioveter-defibrillator,	4
3	**Ventilator:** Mechanism of Respiration, ventilators, Basic block diagram, types, Humidifier, Nebulizer and aspirators	4
4	**Patient Monitoring System:** Overview of ICU,ICCU, Cardiac monitor, Bedside monitor, concept of Central monitoring system, Pulse oximeter, foetal monitoring instrument – method of monitoring Foetal HR,	5
5	**Anesthesia:** Need for anesthesia, Anesthesia machine	3
6	**Instrument for Surgery:** Principle of Surgical Diathermy, Surgical diathermy machine, Cutting and coagulation, Safety aspect.	3
7	**X-Ray machine:** Nature of X-ray, Production of X-ray, Basic block diagram of X-ray machine, construction of X-ray tube, collimator, Bucky grid, types of x-ray machine, digital X-ray,	6
8	**CT Scan Machine:** definition of CT, basic principle of CT scan, Generation of CT machine, Basic block diagram of CT scan machine, System component,	5
9	**USG Machine:** Concept of ultrasound, Physic of ultrasound, characteristic impedance, Basic principle of USG, Production of Ultrasound , Component of USG machine, Modes of USG, Basic Block diagram of USG machine , Transducer probes, 3D, concept of Color Doppler,	6
10	**MRI:** Concept of Nuclear magnet, Basic principle of MRI, Basic block diagram of MRI machine, Magnet, RF transmitter and receiver system, Gradient System	5
TOTAL		45

REFERENCE BOOKS			
Sl. No	Books	Author	Publisher
1	Medical Instrumentation application & design	John G. Webster	Wiley
2	Biomedical Instrumentation	R. S. Khandpur	Tata Mc
3	Biomedical Instrumentation	Cromwell	
4	A text book of Medical Instrument	S. Ananthi	
5	Biomedical Instrumentation	Carr and Brown	

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3. RADIOGRAPHY TECHNIQUES

Course: Diploma in Medical Laboratory Technology Subject of Study: **Radiography techniques** Subject Code: MLT 503 Subject Offered in : **MLT Part-III 5th Semester** Contact Periods: 2 L / Week Subject: **Theoretical** Duration: **17 weeks**	**Credit: 2**	
	Evaluation Scheme:	
	Internal: TA: 5 + CT: 10	15
	ESE	35
	Total Marks	**50**

AIM:

1. To acquire the basic knowledge of the different Medical Imaging system.
2. To know the X-Ray, CT, USG & MRI procedure.
3. To know the Patient care during the above procedure.

TEACHING SCHEME			
Teaching	15 weeks	30 Periods	30 Hrs
Internal Assessment	2 weeks	4 Periods	4 Hrs
Total Contact Periods:	17 weeks	34 Periods	34 Hrs

END SEMESTER EXAMINATION SCHEME							
Sl. No	Questions	Group	From Unit	To be Set	To be Answered	Allotted Marks	Total Marks
1. a. b. c.	**Objective Questions** MCQ Fill in the blanks True/False		1 , 2, 3, 4	6 5 5	4 3 3	1 x 4 1 x 3 1 x 3	**10**
2. To 10	**Subjective Questions** (May have Part Marking)	A B	1,2 3,4	5 4	Any 5 taking at least two from each group	5 x 5	**25**
Total							35

DETAIL SUBJECT CONTENT		
Unit	**Topic**	**Contact Periods**
1	**X-Ray Techniques:** Basic principle of x-ray imaging, Composition of x-ray film, concept of dark room processing, Patient care , X-ray cassette, Loading of X-ray film, Exposures – KV, mAS, Filtration, Field size, Distance, Focal spot size, Films and screen, Grids, Air gap technique, Positioning of Patient, Radiation protection, X-ray procedure, Basic views of different parts, C-R system, digital x-ray, Overview of - soft tissue radiography and uses, Multiple radiography, Stereography, Macroradiography, Subtraction –Photography, Electronic and color subtraction, Uses of subtraction, x-ray Hazards,	12
2	**Computed Tomography:** Introduction to Tomography, Indications, Mechanics, Blur, Exposure factors, Multisection tomography, Principle of CT scanning, Apparatus, Thickness of slice, Image storage, Localisation of level of cut, Contrast medium enhancement, Radiation dose, Uses, Patient Hazards, Patient safety	5
3	**Ultrasonography:** Principle, Display of Ultrasound images – A, M, B mode, Real time scans, Doppler effect, Duplex Scanner, Obstetric Scanning, Echocardiography, Patient preparation, Uses,	7
4	**MPI:** Principle, Relaxation, pulse sequence, Apparatus, Hazards, Patient care, Warning, Uses	6
	Total	30

REFERENCE BOOKS			
Sl. No	Books	Author	Publisher
1	Diagnostic radiography	Bryan	ISE
2	Biomedical Instrumentation	R. S. Khandpur	Tata Mc
3	Medical Instrumentation application & design	John G. Webster	Wiley
4	A text book of Medical Instrument	Cromwell	
5	Medical Instrument	S. Ananthi	
6	Text book of Radiology for Residents and Technician	Prof. Satish Kr. Bhargava	CBS

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4. ELECTRICAL & ELECTRONICS MEASUREMENT

Course: Diploma in Medical Laboratory Technology Subject of Study: **Electrical & Electronics Measurement** Subject Code: MLT 504 Subject Offered in : **MLT Part-III 5th Semester** Contact Periods: 2 L + 1 TU / Week Subject: **Theoretical** Duration: **17 weeks**	**Credit: 2**	
	Evaluation Scheme:	
	Internal: TA: 5 + CT: 10	15
	ESE	35
	Total Marks	**50**

AIM:

1. To be Familiar with the Electrical & Electronics measuring techniques.
2. To study the CRO
3. To study of signal generator and timer circuit.
4. To study of wave analysis

TEACHING SCHEME			
Teaching	15 weeks	45Periods	45 Hrs
Internal Assessment	2 weeks	6 Periods	6Hrs
Total Contact Periods:	17 weeks	51Periods	51Hrs

END SEMESTER EXAMINATION SCHEME							
Sl. No	Questions	Group	From Unit	To be Set	To be Answered	Allotted Marks	Total Marks
1.	**Objective Questions**						**10**
a.	MCQ		1 to 10	6	4	1 x 4	
b.	Fill in the blanks			5	3	1 x 3	
c.	True/False			5	3	1 x 3	
2.	**Subjective Questions**	A	1, 2, 3	3	Any 5 taking at least **one** from each group	5 x 5	**25**
To	(May have Part Marking)	B	4, 5, 6	4			
12		C	7, 8, 9,10	4			
Total							70

DETAIL SUBJECT CONTENT		
Unit	**Topic**	**Contact Periods**
1	**Measurement Fundamentals:** Explanation of accuracy, precision, sensitivity, resolution, dynamic range, response and repeatability of measuring instruments. Role of Units in measurements and different types of units – Definition of Errors and type of errors – Definition of Primary and Secondary Standards – Concept of Calibration.	3
2	**Permanent Magnet Moving Coil Meter:** Theory of operation, working principle and construction of PMMC. Measurement of voltage, current and resistance. Loading effect, extension of range and PMMC Multimeter.	4
3	**Measurement of Voltage, Current, Energy & Power:** Principle of rectifier type instrument – Average reading and peak reading – Advantages and limitations. Compensated thermocouple type instruments – Construction and working principle of electrodynamics wattmeter.	3
4	**Electronic Voltmeter & Multi Meter:** Advantages of electronic voltmeter over ordinary voltmeter. Working principle of Digital Multi Meter – Different types of DMM: Integration and successive approximation type. Advantages of DMM over Conventional Multi Meter.	4
5	**Impedance Bridge & Q-Meter:** DC Wheatstone Bridge and its application – AC bridge-balance – Detection and source of excitation – Maxwell's induction bridge – Hay's bridge – De-sauté bridge-Capacitance comparison bridge -Anderson bridge– Wien Bridge. Basic principle of Q-Meter and its working circuit. Basic principle and operation of RLC meter	6
6	**Cathode Ray Oscilloscope:** Block diagram of CRO, constructional features of CRT and principle of operation. Block schematic description of: (a) Vertical Amplifier, (b) Time Base Generator, (c) Trace Synchronization, (d) Triggering Modes, (e) Front Panel Controls, (f) Probe Characteristics Features of dual trace oscilloscopes, chopper beam switch, alternate beam switch. Block schematic description of digital storage oscilloscope. Measurement of amplitude, frequency, time period, phase angle and delay time by CRO.	7
7	**Time & Frequency Measurement:** Measurement of frequency by heterodyne method – Block schematic description of digital frequency counter. Measurement of frequency, time period and time interval through frequency counter	4
8	**Signal Generator:** Block schematic descriptions, specifications and uses of: Audio & Radio Frequency Signal Generator – Function Generator – Pulse Generator	6

9	**RF Power Measurement:** Bolometer – Method of power measurement – Balance Bridge Bolometer	3
10	**Frequency Spectrum, Distortion & Wave Analysis:** Basic working principle of Heterodyne Wave Analyzer, Block schematic description of Harmonic Distortion Analyzer. Block schematic description of Spectrum Analyzer and its use.	5
	Total	45

REFERENCE BOOKS			
Sl. No	Books	Author	Publisher
1	Electrical & Electronics Measurement	A.K. Sahanney	Dhanpat Rai
2	Electronics Instrumentation	H.S. Kalsi	TMG
3	Modern Electronics Instrumentation & Measurement technique	Helfrick & Cooper	PHI
4	Electrical & Electronic Measurement & Instrumentation	Umesh Singha	Satya Pracashan

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5. DIGITAL LOGIC DESIGN

Course: Diploma in Medical Laboratory Technology Subject of Study: **Digital Logic Design** Subject Code: MLT 505 Subject Offered in : **MLT Part-III 5th Semester** Contact Periods: 3 L / Week Subject: **Theoretical** Duration: **17 weeks**	**Credit: 3**	
	Evaluation Scheme:	
	Internal: TA: 10 + CT: 20	30
	ESE	70
	Total Marks	**100**

AIM:

1. To acquire the basic knowledge of digital techniques
2. To understand the basic logic to design the digital circuit
3. To be familiar with the Boolean algebra and simplification of Boolean expression
4. To design the digital counter.

TEACHING SCHEME			
Teaching	15 weeks	45Periods	45 Hrs
Internal Assessment	2 weeks	6 Periods	6Hrs
Total Contact Periods:	17 weeks	51Periods	51Hrs

END SEMESTER EXAMINATION SCHEME							
Sl. No	Questions	Group	From Unit	To be Set	To be Answered	Allotted Marks	Total Marks
1. a. b. c.	**Objective Questions** MCQ Fill in the blanks True/False		1 to 6	10 8 8	8 6 6	1 x 8 1 x 6 1 x 6	**20**
2. To 10	**Subjective Questions** (May have Part Marking)	A B C	1,2 3, 4 5,6	3 3 3	Any 5 taking at least **one** from each group	10 x 5	**50**
Total							70

DETAIL SUBJECT CONTENT		
Unit	**Topic**	**Cont. Periods**
1	**Number Systems & Code:** Simple arithmetic using positive and negative binary numbers: Addition, Subtraction, Division — Different Weighted & Non-weighted codes — Error correcting codes	3
2	**Boolean Algebra & Logic Gates:** Definition of Boolean Algebra — Boolean Theorems (with their proofs) — Standard forms of expression & their conversion from one to another — LOGIC GATES: AND, OR, NOT, NAND, NOR, XOR, XNOR (truth table, logic expression, symbol) — Simple logic circuits using these gates.	7
3	**Simplification of Logic Expressions** Simplification of Boolean expression or logic expression using — (i) Boolean Algebra; (ii) Karnough Maps & (iii) Quine Maclusky Method	5
4	**Combinational Logic Circuits :** Arithmetic Circuits: Half adder – Full adder – Half subtractor – Full subtractor (truth table, logic expression, equivalent circuit diagram – brief description) — Comparator – Multiplexer – Demultiplexer / Decoder – Code Converter – Encoder – Parity Generator & Checker.	10
5	**Sequential Circuits:** Introduction to sequential circuits — Model of sequential circuits: latch & flip flops – timing parameters of latch & flip flops – conversion of one flip flop to another — COUNTER: Introduction to counter – Binary ripple counter (UP/DOWN) – Module-n-counter – Synchronous & Asynchronous counter — REGISTERS: Shift registers – Serial data – Parallel data – Design of registers & their functional detail	13
6	**Data Converter:** DIGITAL TO ANALOG CONVERTER (DAC): Weighted register ladder, Commercially Available DAC — ANALOG TO DIGITAL CONVERTER (ADC): Different types – Successive approximation – Dual – Slope type – ADC performance – Commercially available ADC	7
	Total	45

REFERENCE BOOKS			
Sl. No	**Books**	**Author**	**Publisher**
1	Digital Logic & Computer Design	M. Morris Mano	Prentice Hall of India, N. D
2	Digital Principles & Applicatio	Malvino & Leach	Tata McGraw-Hill
3	Modern Digital Electronics	R.P. Jain	Tata McGraw-Hill
4	Digital Logic Applications & Design	M. Yarbrough	Vikash Publishing House
5	Digital Computer Electronics	Malvino & Brown	Tata McGraw-Hill
6	Digital Systems	Ronald J. Tocsin	Prentice Hall of India, N. Delhi
7	Fundamental of Digital Circuits	A. Anand Kumar	Prentice Hall of India, N. Delhi
8	Digital Electronics & Microcomputers	R. K. Gaur	Dhanpat Rai Publications
9.	Digital Logic Design	Salivan	Vikash Publishing

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6. HOSPITAL & INDUSTRIAL MANAGEMENT

Course: Diploma in Medical Laboratory Technology Subject of Study: **Hospital & Industrial Management** Subject Code: MLT 506 Subject Offered in : **DMLT Part-III 5th Semester** Contact Periods: 2L / Week Subject: **Theoretical** Duration: **17 weeks**	**Credit: 2**	
	Evaluation Scheme:	
	Internal: TA: 5 + CT: 10	15
	ESE	35
	Total Marks	**50**

AIM:

1. To acquire the basic knowledge of Different types of hospital.
2. To know the different department of a hospital
3. To know role of Biomedical Engineer in hospital and Industry
4. To introduce the Industrial management

TEACHING SCHEME			
Teaching	15 weeks	30Periods	30 Hrs
Internal Assessment	2 weeks	4 Periods	4Hrs
Total Contact Periods:	17 weeks	34Periods	34Hrs

END SEMESTER EXAMINATION SCHEME							
Sl. No	Questions	Group	From Unit	To be Set	To be Answered	Allotted Marks	Total Marks
1. a. b. c.	**Objective Questions** MCQ Fill in the blanks True/False		1, 2	6 5 5	4 3 3	1 x 4 1 x 3 1 x 3	**10**
2. To 10	**Subjective Questions** (May have Part Marking)	A B	1 2	5 4	Any 5 taking at least **two** from each group	5 x 5	**25**
Total							70

DETAIL SUBJECT CONTENT		
Unit	**Topic**	**Cont. Periods**
1	**Overview of the Hospital Management:** Hospital, Administration of a hospital, Aspect of Hospital services, classification of hospital, Departments of a hospital, Hospital Engineering, Modern hospital architecture – space, building, design of ward, Biomedical engineering department, Role of a Biomedical Engineer, Electrical power system in hospital , safety of electrical system, fire protection system in the hospital, Uninterrupted power supply for ICU, health awareness, Air conditioning & gas supply system in the hospital , Quality control, quality assurance, quality improve, Importance of ISO 9000 certificate, disposal of hospital waste materials	15
2	**Overview of Industrial management:** Human resource management, Industrial relation, trade union, Recruitment and selection, Administrative theory, Motivation, Guideline to make communication effective, Concept of quality management, Cost of quality, quality control, Total quality management, service quality, Function of production management, productivity, Safety & environment management, concept of safety, Physical & psychological safety, Fire & fire prevention, Environmental pollution & its control,	15
	Total	30

REFERENCE BOOKS			
Sl. No	Books	Author	Publisher
1	Hospital Management Engineering	Harold E.Smalley	PHI
2	Clinical Engineering	C. A. Caccras	
3	Hospital & Healthcare Facilities	L.C. Redstone	
4	Industrial Management (Vol-1)	L.C. Jhamb	EPH
5	Industrial Relations, Trade Union & labour Legislation	Sinha	Pearson Education Asia
6	Organizational Behavior	S.P. Robbins	PHI
7	Production & Operation Managment	S.N. Chary	TMH

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7. CLINICAL MICROBIOLOGY LAB.

Course: Diploma in Medical Laboratory Technology Subject of Study: **Clinical Microbiology Lab.** Subject Code: MLT P507 Subject Offered in : **DMLT Part-III 5th Semester** Contact Periods: 2PR / Week Subject: **Practical** Duration: **17 weeks**	**Credit: 1**	
	Evaluation Scheme:	
	Internal:	25
	External Exam.	25
	Total Marks	**50**

AIM:

1. To acquire the basic knowledge of the Serological tests
2. To practice of Serological tests.
3. To acquire the basic knowledge of biopsy.
4. To acquire the Medical Laboratory techniques.

EVALUATION SCHEME			
Sl. No	**Assessment/ examination**	**Distribution of Marks**	**Total Marks**
1	**Internal Assessment:** * Continuous Internal Assessment is to be carried out by the teacher throughout the semester	Experiment : 10 Attendance: 5 Lab. Report: 5 Viva Voce: 5	25
2	**External Examination:** * External Examination shall be held at the end of the semester * Each Student have to perform one Expt. allotted by lottery basis	On spot Experiment: 10 On spot Report: 5 Viva-Voce: 10	25
Total			50

DETAIL SUBJECT CONTENT	
Sl. No	List of Experiments/ Jobs
1	Study of hot-air-oven for dry heat sterilization
2	Study of autoclave for moist heat sterilization
3	Study of Incubator.
4	Preparation of swab stick and sterilization
5	Preparation of different types of culture media.
6	Study of Respiratory track specimen culture
7	Gram's Staining
8	AF staining
9	Laboratory diagnosis of tuberculosis
10	Laboratory diagnosis of urinary tract infection
11	Laboratory diagnosis of Gonorrhea
12	Examination of stool for ova, parasite

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8. BIOMEDICAL INSTRUMENTATION-III LAB.

Course: Diploma in Medical Laboratory Technology Subject of Study: **Biomedical Instrumentation-III Lab.** Subject Code: MLT P508 Subject Offered in : **DMLT Part-III 5th Semester** Contact Periods: 3PR / Week Subject: **Practical** Duration: **17 weeks**	**Credit: 2**	
	Evaluation Scheme:	
	Internal:	50
	External Exam.	50
	Total Marks	**100**

AIM:

1. To study the working principle of different therapeutic instrument and Medical Imaging Instrument
2. To identify the parts of the above instruments.
3. To study of different biomedical instruments.

EVALUATION SCHEME			
Sl. No	**Assessment/ examination**	**Distribution of Marks**	**Total Marks**
1	**Internal Assessment:** * Continuous Internal Assessment is to be carried out by the teacher throughout the semester	Experiment : 20 Attendance: 10 Lab. Report: 10 Viva Voce: 10	50
2	**External Examination:** * External Examination shall be held at the end of the semester * Each Student have to perform one Expt. allotted by lottery basis	On spot Experiment: 20 On spot Report: 10 Viva-Voce: 20	50
Total			100

DETAIL SUBJECT CONTENT	
Sl. No	List of Experiments/ Jobs
1	Study of components & operation of the cardiac pacemaker
2	Study of DC defibrillator
3	Study of Ventillator
4	Study of Patient monitor
5	Study of Pulse oximeter
6	Study of X-ray machine
7	Study of USG machine
8	Study of CT machine
9	Study of MRI machine

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9. RADIOGRAPHY TECHNIQUES LAB.

Course: Diploma in Medical Laboratory Technology	**Credit: 2**	
Subject of Study: **Radiography Techniques Lab.**	Evaluation Scheme:	
Subject Code: MLT P509	Internal:	25
Subject Offered in : **DMLT Part-III 5th Semester**		
Contact Periods: 3PR / Week	External Exam.	25
Subject: **Practical** Duration: **17 weeks**	**Total Marks**	**50**

AIM:

1. To be familiar with the medical Imaging techniques.
2. To acquire the basic knowledge of x-Ray procedure.
3. To be familiar with the CR system
4. To be familiar with the ultrasonography

EVALUATION SCHEME			
Sl. No	**Assessment/ examination**	**Distribution of Marks**	**Total Marks**
1	**Internal Assessment:** * Continuous Internal Assessment is to be carried out by the teacher throughout the semester	Experiment : 10 Attendance: 5 Lab. Report: 5 Viva Voce: 5	25

2	**External Examination:** * External Examination shall be held at the end of the semester * Each Student have to perform one Expt. allotted by lottery basis	On spot Experiment: 10 On spot Report: 5 Viva-Voce: 10	25
Total			50

DETAIL SUBJECT CONTENT	
Sl. No	List of Experiments/ Jobs
1	Study of CR system
2	Chest X-ray
3	X-Ray of different parts of the upper limb
4	X-Ray of Elbow
5	X-Ray of Shoulder joint
6	X-Ray of different parts of the lower limb
7	X-ray of Skull
8	Ultrasonography
9	Recording of Echocardiography
10	Recording of Color Doppler
11	Study of CT scanning

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10. ELECTRICAL & ELECTRONICS MEASUREMENT LAB.

Course: Diploma in Medical Laboratory Technology Subject of Study: **Electrical & Electronics Measurement Lab.** Subject Code: MLT P510 Subject Offered in : **DMLT Part-III 5th Semester** Contact Periods: 2PR / Week Subject: **Practical** Duration: **17 weeks**	**Credit: 1**	
	Evaluation Scheme:	
	Internal:	25
	External Exam.	25
	Total Marks	**50**

AIM:

1. To be familiar with the Transistor biasing and Amplifier
2. Design of amplifier circuit
3. To acquire the basic knowledge of Oscillator
4. To be familiar with the OPAMP IC and its Application
5. To be familiar with the IC 555

EVALUATION SCHEME			
Sl. No	**Assessment/ examination**	**Distribution of Marks**	**Total Marks**
1	**Internal Assessment:** * Continuous Internal Assessment is to be carried out by the teacher throughout the semester	Experiment : 10 Attendance: 5 Lab. Report: 5 Viva Voce: 5	25
2	**External Examination:** * External Examination shall be held at the end of the semester * Each Student have to perform one Expt. allotted by lottery basis	On spot Experiment: 10 On spot Report: 5 Viva-Voce: 10	25
Total			50

DETAIL SUBJECT CONTENT	
Sl. No	List of Experiments/ Jobs
1	Measurement of frequency
2	Measurement of Waveform phase & time interval
3	Study of Square wave generator

4	Study of Power factor meter
5	Study of CRT
6	To measure the unknown inductance by Heys Bridge
7	To measure the unknown inductance by Anderson Bridge
8	To measure the unknown capacitance by De sauty bridge
9	To measure the unknown frequency by Wein Bridge.
10	To construct and test a Q-meter
11	Study of Display counter
12	Study the spectrum analyzer.

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11. DIGITAL LOGIC DESIGN LAB.

Course: Diploma in Medical Laboratory Technology Subject of Study: **Digital Logic Design Lab.** Subject Code: MLT P511 Subject Offered in : **DMLT Part-III 5th Semester** Contact Periods: 2PR / Week Subject: **Practical** Duration: **17 weeks**	**Credit: 1**	
	Evaluation Scheme:	
	Internal:	25
	External Exam.	25
	Total Marks	**50**

AIM:

1. To be familiar with the basic logic gates & their ICs
2. Design of combinational Circuits
3. Design of Counter & Register
4. Study of ADC & DAC Circuits

EVALUATION SCHEME			
Sl. No	**Assessment/ examination**	**Distribution of Marks**	**Total Marks**
1	**Internal Assessment:** * Continuous Internal Assessment is to be carried out by the teacher throughout the semester	Experiment : 10 Attendance: 5 Lab. Report: 5 Viva Voce: 5	25
2	**External Examination:** * External Examination shall be held at the end of the semester * Each Student have to perform one Expt. allotted by lottery basis	On spot Experiment: 10 On spot Report: 5 Viva-Voce: 10	25
Total			50

DETAIL SUBJECT CONTENT	
Sl. No	**List of Experiments/ Jobs**
1	Verification of the truth tables for AND, OR, NOT, XOR, XNOR, NAND AND NOR gates.
2	Design Half adder and Full adder using all NAND gates or with all NOR gates.
3	Realization of a truth table or a logic expression using the minimum number of logic gates.
4	Study 4-bit full adder IC chip (7483); Cascading of 7483.
5	Design 1's, 2's, 9's and 10's complement circuit using full adder.
6	Design BCD adder.
7	Design a simple multiplexer using discreet logic gates.
8	Use of commercial multiplexer using IC chips for the design of combinational circuits.
9	Design simple decoder using discreet logic gates.
10	Design Gray-to-Binary and Binary-to-Gray code converter using discrete logic gates, multiplexers & decoders.
11	Design RS and D latch using all NAND gates or NOR gates.
12	Debounce mechanical switch using latch.

13	Design Master Slave JK flip-flop.
14	Design ripple counter.
15	Design synchronous counter.
16	Study of some commercially available counter chips.
17	Design of shift registers using flips-flops and to study its behaviour.
18	Study commercially available shift register IC chips.
19	Design astable and monostable multivibrator using 555 timer chip.
20	Study commercially available ADC and DAC chips.
21	Design ramp generator using DAC and counter.

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12. PROJECT & ENTREPRENEURSHIP DEVELOPMENT

Course: Diploma in Medical Laboratory Technology Subject of Study: **Project & Entrepreneurship Development** Subject Code: MLT P512 Subject Offered in : **DMLT Part-III 5th Semester** Contact Periods: 3PR / Week Subject: **Practical** Duration: **17 weeks**	**Credit: 2**	
	Evaluation Scheme:	
	Internal:	50
	External Exam.	-
	Total Marks	**50**

AIM:

1. To built up the creativity
2. To enhance the decision making capability
3. To face the problems and solution
4. To allow to do a job as their choice/interest

EVALUATION SCHEME			
Sl. No	**Assessment/ examination**	**Distribution of Marks**	**Total Marks**
1	**Internal Assessment:** * Continuous Internal Assessment is to be carried out by the teacher throughout the semester, Project proposal have to evaluate for the marks.	Project proposal: 10 Performance: 20 Attendance: 10 Viva Voce: 10	50
Total			50

DETAIL SUBJECT CONTENT	
Sl. No	List of Experiments/ Jobs
1	Follow the different magazine, Research paper, Internet, recent development on the biomedical field. Prepare a project proposal and submit to the project advisor for approval. The project work may be done on Circuit fabrication, signal processing, data acquisition/ software used in biomedical field according to feasibility. Project work may be done in the Institute/ Hospital / Industry.

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13. PROFESSIONAL PRACTICE-III

Course: Diploma in Medical Laboratory Technology Subject of Study: **Professional Practice-III.** Subject Code: MLT P513 Subject Offered in : **DMLT Part-III 5th Semester** Contact Periods: 1PR / Week Subject: **Practical** Duration: **17 weeks**	**Credit: 1**	
	Evaluation Scheme:	
	Internal:	50
	External Exam.	-
	Total Marks	**50**

AIM:

1. Identify the fundamental principles of using personal computers
2. Identify the names, purposes and characteristics of storage devices
3. Identify the fundamental principles of networks
4.

EVALUATION SCHEME			
Sl. No	**Assessment/ examination**	**Distribution of Marks**	**Total Marks**
1	**Internal Assessment:** * Continuous Internal Assessment is to be carried out by the teacher throughout the semester	Performance: 20 Attendance: 10 Lab Report: 10 Viva Voce: 10	50
Total			50

DETAIL SUBJECT CONTENT	
Sl. No	List of Experiments/ Jobs
1	Identify the names, purposes and characteristics of storage devices
2	Concept of computer networking
3	Application of Matlab
4	Application of data acquisition software

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NOTE THE FOLLOWING REQUIREMENTS:

1. During this semester Minimum one guest lecture by industry / medical personnel
2. Minimum one Hospital/ Industrial visit
3. Minimum one Hospital/ Industrial Training on hardware/ soft ware used in medical field.

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