MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC
Sector-01, Kamothe, Navi Mumbai -410 209
Tel 022-27432471, 022-27432994, Fax 022 -27431094
E-mail: registrar@mgmuhs.com; Website :www.mgmuhs.com

CHOICE BASED CREDIT SYSTEM

(CBCS)

(with effect from 2021-22 Batches)

Curriculum for

M.Sc. Medical Dialysis Technology

Amended upto AC-49/2024, Dated 25/04/2024

Amended History

1. Approved as per AC-41/2021 Resolution No.[3.1], Dated 27/08/2021
2. As Amended In AC-42/2022 [Resolution No. 4.2 i & ii], [Resolution No. 10.4.i]
3. As Amended In AC-49/2024 [Resolution No.3.10 ii], Dated 25/04/2024

DIRECTOR'S MESSAGE

I take this opportunity to welcome you on behalf of MGM family to the Masters Degree at MGM School of Biomedical Sciences (MGM SBS).

MGM School of Biomedical Sciences (MGM SBS) established in the year 2007, the MGM School of Biomedical Sciences envisaged building a progressive learning community and is committed to pursuit of excellence in higher education, total development of personality and shaping the students into sensitive, self-reliant citizens of the country imbued with the ideals of secularism and a scientific aptitude. We set global standards to make our students scientifically as well as ethically stronger. The college adopts the national qualification frame work for the post-graduate programs which has adopted Credit Base Choice System (CBCS) so that, we construct a value based system of education that encourages critical thinking and creativity, a research platform as opposed to rote learning.

The P.G (M.Sc.) courses offered are; Medical Anatomy, Medical Physiology, Medical Biochemistry, Medical Microbiology, Medical Pharmacology, Biotechnology, Genetics, Molecular Biology, Masters in Hospital administration and Biostatistics, M.Sc. Cardiac Care Technology, M.Sc. Medical Radiology and Imaging Technology, M. Optometry, M.Sc. Medical Dialysis Technology. Over time, the program has evolved, to meet the challenges of the ever changing field of biomedical education system.

With Best Wishes,

Director
MGM School of Biomedical Sciences

ABOUT MGM SCHOOL OF BIOMEDICAL SCIENCES

Mission

To improve the quality of life, both at individual and community levels by imparting quality medical education to tomorrow's doctors and medical scientists and by advancing knowledge in all fields of health sciences though meaningful and ethical research.

Vision

By the year 2022, MGM Institute of Health Sciences aims to be top-ranking Centre of Excellence in Medical Education and Research. Students graduating from the Institute will have the required skills to deliver quality health care to all sections of the society with compassion and benevolence, without prejudice or discrimination, at an affordable cost. As a research Centre, it shall focus on finding better, safer and affordable ways of diagnosing, treating and preventing diseases. In doing so, it will maintain the highest ethical standards.

About – School of Biomedical Sciences

MGM School of Biomedical Sciences is formed under the aegis of MGM IHS with the vision of offering basic Allied Science and Medical courses for students who aspire to pursue their career in the Allied Health Sciences, teaching as well as research.

School of Biomedical Sciences is dedicated to the providing the highest quality education in basic medical sciences by offering a dynamic study environment with well equipped labs. The school encompasses 21 courses each with its own distinct, specialized body of knowledge and skill. This includes 7 UG courses and 14 PG courses. The college at its growing years started with mere 100 students has recorded exponential growth and is now a full-fledged educational and research institution with the student strength reaching approximately 581 at present.

Our consistent theme throughout is to encourage students to become engaged, be active learners and to promote medical research so that ultimately they acquire knowledge, skills, and understanding so as to provide well qualified and trained professionals in Allied Health Sciences to improve the quality of life.

As there is increased need to deliver high quality, timely and easily accessible patient care system the collaborative efforts among physicians, nurses and allied health providers become ever more essential for an effective patient care. Thus the role of allied health professionals in ever-evolving medical system is very important in providing high-quality patient care.

Last but by no means least, School of Biomedical Sciences envisions to continuously grow and reform. Reformations are essential to any growing institution as it fulfills our bold aspirations of providing the best for the students, for us to serve long into the future and to get ourselves updated to changing and evolving trends in the health care systems.

Name of the Degree: M.Sc. Medical Dialysis Technology

Duration of Study:

The duration of the study for M.Sc. Medical Dialysis Technology will be of 2 years.

Eligibility Criteria:

B.Sc. Dialysis Tech: These candidates are by far the most eligible as they have been trained in this very field for 3 years followed by a year of internship.

MBBS
: These candidates are exposed to nephrology and dialysis during their course curriculum, albeit for a lesser duration. However, this will give those candidates an opportunity to specialize, who do not want to spend 6 more years through the conventional academic route.

B.Sc. Nursing: These candidates too have been exposed to Nephrology and dialysis during their graduation and hence are eligible.

Medium of Instruction:

English shall be the Medium of Instruction for all the Subjects of study and for examinations.

For any query visit the website: www.mgmsbsnm.edu.in

Program Outcome:

- Nurture the scientific and/or clinical knowledge and skills for development of health care practices, industrial/ community applications and entrepreneurship.
- Develop the ability of critical thinking to analyze, interpret problems in health care and to find out systematic approach for solution
- Impart decision making capability for handling various circumstances in their respective areas
- Demonstrate research skills for planning, designing, implementation and effective utilization of research findings for community.
- Develop an ability to function as an efficient leader as well a team player in multidisciplinary sectors for effective outcomes demonstrating managerial skills
- Demonstrate an effective written and oral communication skills to communicate effectively in health care sector, industries, academia and research.
- Inculcate code of ethics in professional and social circumstances to execute them in daily practices and research in respective areas of specialization
- Develop lifelong learning attitude and values for enhancement of professional and social skills for an overall development

Program Specific Outcome:

- The primary goal of the Master of Science in Medical Dialysis Technology program is to prepare accomplished professionals in Dialysis Technology with a specific emphasis on clinical skills and technical knowledge along with professional research.
- Students will acquire the research-based knowledge and procedural skills necessary to deliver a high standard of care to the patients with chronic kidney disease requiring renal replacement therapy.
- This course involves all aspects of care for patients undergoing chronic hemodialysis.
- Overall goal of this training is to foster the student's development into an independent care provider and researcher in the field of dialysis.
- The program intends for its post graduates to contribute to a new generation of academic dialysis professional equipped to address the challenging problems in renal replacement therapy

Resolution No. 4.2 of Academic Council (AC-42/2022)
Resolved to accept the correction for typo error in the Syllabus for M.Sc. Medical Dialysis Technology (Semester I & II) approved in AC-41/2021 for index as MMDT- Directed Clinical Education-I & II instead of MRSDT- Directed Clinical Education-I & II. **[ANNEXURE-44]**

OUTLINE OF COURSE CURRICULUM

M.Sc. Medical Dialysis Technology

Semester I

Code No.	Core Course	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total
Theory														
MMDT 101 L	Anatomy (Nephroanatomy & Histology)	3	-	-	-	**3**	45	-	-	-	**45**	20	80	**100**
MMDT 102 L	Physiology (Nephrophysiology)	4	-	-	-	**4**	60	-	-	-	**60**	20	80	**100**
MMDT 103 L	Nephrogenetics& Pharmacology	3	-	-	-	**3**	45	-	-	-	**45**	20	80	**100**
MMDT 104 L	Water Treatment	2	-	-	-	**2**	30	-	-	-	**30**	20	80	**100**
MMDT 105 CP	MMDT Directed Clinical Education - I	-	-	-	15	**5**	-	-	-	225	**225**	-	50	**50**
Practical														
MMDT 101 P	Anatomy (Nephroanatomy & Histology)	-	-	1	-	**1**	-	-	15	-	**30**	10	40	**50**
MMDT 102 P	Physiology (Nephrophysiology)	-	-	1	-	**1**	-	-	15	-	**30**	10	40	**50**
Total		**12**	**0**	**2**	**15**	**19**	**180**	**0**	**30**	**225**	**465**	**100**	**450**	**550**

OUTLINE OF COURSE CURRICULUM

M.Sc. Medical Dialysis Technology

Semester II

Code No.	Core Course	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total
Theory														
MMDT 106 L	Aetio-Pathology of Renal Disease	3	-	-	-	**3**	45	-	-	-	**45**	20	80	**100**
MMDT 107 L	Clinical Nephrology	3	-	-	-	**3**	45	-	-	-	**45**	20	80	**100**
MMDT 108 L	Dialysis Equipment	3	-	-	-	**3**	45	-	-	-	**45**	20	80	**100**
MMDT 109 CP	MMDT Directed Clinical Education - II	-	-	-	15	**5**	-	-	-	225	**225**	-	50	**50**
CC 001 L	Research Methodology & Biostatistics (Core Course)	4	-	-	-	**4**	60	-	-	-	**60**	20	80	**100**
Practical														
MMDT 107 P	Clinical Nephrology	-	-	2	-	**1**	-	-	15	-	**30**	10	40	**50**
MMDT 108 P	Dialysis Equipment	-	-	2		**1**	-	-	15	-	**30**	10	40	**50**
CC 001 P	Research Methodology & Biostatistics (Core Course)	-	-	4	-	**2**	-	-	30	-	**60**	10	40	**50**
Core Elective Course														
CEC 001 L	Basics of Clinical Skill Learning	3	-	-	-	**3**	45	-	-	-	**45**	20	80	**100**
CEC 002 L	Hospital Operation Management													
Total		**16**	**0**	**8**	**15**	**25**	**240**	**0**	**60**	**225**	**585**	**130**	**570**	**700**

FIRST YEAR

M.Sc. Medical Dialysis Technology

SEMESTER-I

Code No.	Core Subjects
Theory	
MMDT 101 L	Anatomy (Nephroanatomy & Histology)
MMDT 102 L	Physiology (Nephrophysiology)
MMDT 103 L	Nephrogenetics & Pharmacology
MMDT 104 L	Water Treatment
MMDT 105 CP	MMDT Directed Clinical Education – I
Practical	
MMDT 101 P	Anatomy (Nephroanatomy & Histology)
MMDT 102 P	Physiology (Nephrophysiology)

Name of the Programme	**M.Sc. Medical Dialysis Technology**
Name of the Course	**Anatomy (Nephroanatomy & Histology)**
Course Code	**MMDT 101 L**

Course Outcome	• Apply to clinical scenarios the concepts and knowledge of the general terminology, cell structure and function, histology, gross anatomy, and physiology of urinary system. • Students will be able to describe and analyze tissue types and organ structure & know the topics of fundamental anatomy and histology. • Students will know and be able to describe the urinary system of the human body, will be able to describe their structure, location, will be able to explain the main regularities of functions.

Sr. No.	**Topics**	**No. of Hrs.**
1	**Basic Nephrology:** Anatomy of the kidney, ureter, urinary bladder, urethra	6
2	**Blood supply & Nerve supply:** Blood supply of urinary system & Nerve supply of urinary system	6
3	**Embryology:** Embryology of urinary system	4
4	**Peritoneal Cavity:** Peritoneum, folds & recesses	4
5	**Histology:** T.S. of a human kidney, Photomicrograph of renal cortex, Photomicrograph of the blood supply to the kidney cortex, Photomicrograph of the renal corpuscle, Microscope of the visceral epithelium, Microscope of a peripheral portion of a renal corpuscle, Electron microscope of glomerular filtration barrier, Diagram of a lobule of glomerular capillaries, Juxta glomerular complex, Renal cortex, Renal cortex showing the proximal convoluted tubule & distal convoluted tubule, Proximal convoluted tubule, Renal medulla, Renal papilla, Collecting tubule, Deep cortical area & outer medulla, Kidney cortex the JG apparatus, Kidney Medulla- papilla, Papilla adjacent to a calyx, T.S. of ureter, Ureter wall T.S., Urinary bladder T.S., Urinary bladder mucosa	25
Total		**45 hrs**

MMDT 101 P- Anatomy (Nephroanatomy & Histology)

Sr. No.	Topics	No. of Hrs.
1	Anatomy of urinary system	5
2	Embryology of urinary system	5
3	Histology	20
Total		**30 hrs**

Reference Text Books:

1. Manipal Manual of Anatomy for Allied Health Sciences courses:Madhyastha S.
2. G.J. Tortora& N.P Anagnostakos: Principles of Anatomy and Physiology
3. B.D. Chaurasia: Handbook of General Anatomy

Reference books or related websites:www.osmosis.org

Name of the Programme	**M.Sc. Medical Dialysis Technology**
Name of the Course	**Physiology (Nephrophysiology)**
Course Code	**MMDT 102 L**

Course Outcome	• To understand the functions of important physiological systems including the urinary systems. • Students will acquire knowledge on physiology related to Nephrology & physiology applied to dialysis.

Sr. No.	**Topics**	**No. of Hrs.**
1	**The body fluid compartments:** extracellular and intracellular fluids interstitial fluid & edema, Body fluid compartments, Constituents of extracellular and intracellular fluids, Osmotic equilibria and fluid shifts between the extracellular and intracellular fluids, Changes in the volumes and osmolality of the extracellular and intracellular fluid compartments in abnormal states, Edema fluids in the potential spaces of the body	10
2	**Formation of urine by the kidney:** Renal blood flow, Glomerular filtration and their control. physiologic anatomy of the kidney, Basic theory of nephron function, Renal blood flow and pressures, Glomerular filtration and the glomerular filtrate, Control of the glomerular filtration rate and renal blood flow, Reabsorption of fluid by the peri-tubular capillaries	10
3	**Formation of urine by the kidney:** Processing of the filtrate in the tubules, effect of tubular load and tubular transport maximum on urine constituents, the concept of Plasma Clearance its use in assessing renal function	6
4	**Renal associated mechanism for controlling extracellular fluid osmolality and sodium concentration, The mechanism for excreting excess water:** Excretion of a dilute urine, The mechanism for excreting excess solutes: The countercurrent mechanism for excreting a concentrated urine, Control of extracellular fluid osmolality and sodium concentration, Sodium excretion and its control by aldosterone	10
5	**Renal regulation of Blood volume and extracellular fluid Volume:** Excretion and regulation of urea, potassium, and other substances, control of blood volume, control of extra cellular fluid volume, urea excretion, Potassium excretion, Control of the extracellular concentrations of other ions	8
6	**Regulation of Acid-Base Balance**: Function of Acid – Base Buffers, Respiratory regulation of Acid – Base balance, Renal control of Hydrogen Ion concentration, Clinical abnormalities of Acid-Base Balance	8
7	**Renal Disease, Diuresis, and Micturition:** Renal Disease, Renal Function tests, Diuretics and mechanisms of their action, Mictu rition	8
Total		**60 hrs**

MMDT 102 P- Physiology (Nephrophysiology)

Sr. No.	Topics	No. of Hrs.
1	Formation of urine by kidney	4
2	Renal associated mechanism for controlling extracellular fluid osmolality and sodium concentration	12
3	Renal regulation of Blood volume and extracellular fluid Volume: Excretion and regulation of urea, potassium, and other substances. Regulation of Acid-Base Balance.	14
Total		**30 hrs**

Reference Text Books:

1. Basics of medical Physiology –D Venkatesh and H.H Sudhakar, 3rd edition.
2. Principles of Physiology – DevasisPramanik, 5th edition.
3. Human Physiology for BDS –Dr A.K. Jain, 5th edition.
4. Textbook of Medical Physiology, Guyton , 2nd South Asia Edition.
5. Textbook of Physiology Volume I & II – Dr. A. K. Jain.
6. Comprehensive textbook of Medical Physiology Volume I & II – Dr. G. K. Pal.

Name of the Programme	**M.Sc. Medical Dialysis Technology**
Name of the Course	**Nephrogenetics & Pharmacology**
Course Code	**MMDT 103 L**

Course Outcome	• This course gives a general knowledge and application part of the drugs or medicines used for renal problems. • Knowledge of renal, cardio vascular, respiratory, Central Nervous System & corticosteroids to be able to manage renal patients under supervision of a nephrologists and assist a nephrologists.

Sr. No.	Topics	No. of Hrs.
1.	**Nephrogenetics:** **Introduction:** Structure and function of the cell, DNA structure& function, replication, RNA structureand function, protein synthesis, post translational modifications, structure and function of Eukaryotic genes and genome. Genes involved in apoptosis	5
2.	**Transmission Pattern:** Principles of Mutations and types, detection of variousmutations, population variations, polymorphisms, Inheritance pattern, consanguinity in Human population,	5
3.	**Genetic Variation:** Basic concepts of formal genetics, mitochondrial gene and inheritance, Genetic counseling: principles and ethics in dealing with genetic disorders and treatment. Gene therapy	5
4.	**Pharmacology:** **Introduction to Pharmacology:** Principles of Drug Actions, Adm. and Drug Calculations.	4
5.	**Renal Drugs:** Common medications used in the dialysis patient,Principle of action, Administration, Precaution and side effects.	6
6.	**Cardiovascular Drugs:** Common drugs used, Administration, Precaution and side effects.	3
7.	**Respiratory Drugs:** Common drugs used, Administration, Precaution and side effects.	3
8.	**Corticosteroids and other Immunosuppressant:** Drugs used, Principle of action, Administration, Precaution and side effects.	4
9.	**CNS Drugs:** Common drugs used, Administration, Precaution and side effects	3
10.	**Anticoagulant:** Heparin, low molecular weight heparin, protomine etc	5
11.	**Miscellaneous**	2
Total		**45 hrs**

Recommended Text Books:

1. Essentials of Medical Pharmacology – Tripathi

Name of the Programme	M.Sc. Medical Dialysis Technology
Name of the Course	Water Treatment
Course Code	MMDT 104 L

Course Outcome	• Different types of water source and methods of treatment employed by water supply companies. • Ground sources and surface sources and the classification of contaminants. • Potable water regulations. • Necessity to treat potable water for use in dialysis. • Need for chemical limits. • Evaluation of feed water quality, including hardness. • Monitoring & disinfection of water treatment

Sr. No.	Topics	No. of Hrs.
1.	Describe different types of water source and methods of treatment employed by water supply companies.	2
2.	Ground sources and surface sources and the classification of contaminants. Potable water regulations. Necessity to treat potable water for use in dialysis Need for chemical limits. Evaluation of feed water quality, including hardness.	3
3.	National and international standards and limits applicable to water for dialysis.	2
4.	Treatment methods used in the treatment of water for dialysis.	2
5	Different types of sediment filtration including pressure differentials and filter performance.	2
6.	Principle of adsorption in activated carbon, ion exchange and de-ionization	2
7.	Function of UV systems.	2
8.	Principles of membrane technology, including Reverse Osmosis. Suitability of materials to be used for pipe work in dialysis water systems. Flow characteristics od distribution systems.	3
9.	Direct and indirect loops.	2
10.	Prevention of microbiological contamination Commonly used microbiological control methods. Understanding microbial dynamics in water and the prevention of microbial	5

	contamination. The potential effect of chemical and microbiological contaminants on dialysis patients. Ultra filters at point of use.	
11.	Describe methods of sanitization of the water treatment system. Reason and method for testing for residual agents Cleaning and sanitization of water systems including disinfection and cleaning agents used concentrations and contact times. Rinsing protocols	5
Total		**30 hrs**

Books Recommended:

1. Water quality in hemodialysis by E.Bonnie-Schorn, A, Grassmann, I. Uhlenbusch-Korwer, C.Weber, J.Vienken
2. Orientation to National Kidney Foundation Hemodialysis Program – Training Manual by Gay Martin.
3. Dialysis Technology – A Manual for Dialysis Technicians by Jim Curtis, Philip Varughese.

Course code- MMDT 105 CP: MMDT Directed Clinical Education – I

Students will gain additional skills in dialysis procedures, renal science and recent advancements. Students apply knowledge from previous clinical learning experience under the supervision of a senior technologist. **(Total-225 hrs)**

M.Sc. Medical Dialysis Technology

SEMESTER-II

Code No.	Core Subjects
Theory	
MMDT 106 L	Aetio-Pathology of Renal Disease
MMDT 107 L	Clinical Nephrology
MMDT 108 L	Dialysis Equipment
MMDT 109 CP	MMDT Directed Clinical Education-II
CC 001 L	Research Methodology & Biostatistics (Core Course)
Practical	
MMDT 107 P	Clinical Nephrology
MMDT 108 P	Dialysis Equipment
CC 001 P	Research Methodology & Biostatistics (Core Course)
Core Elective Course	
CEC 001 L	Basics of Clinical Skills Learning
CEC 002 L	Hospital Operation Management

Name of the Programme	**M.Sc. Medical Dialysis Technology**
Name of the Course	**Aetio-Pathology of Renal Disease**
Course Code	**MMDT 106 L**

Course Outcome	• The scope of this course is to provide overall information of the pathology, structural abnormalities and symptoms of kidney diseases. • To have knowledge of common medications used in dialysis, its administration & side effects. • To know total patient care during dialysis & dietary management.

Sr. No.	Topics	No. of Hrs.
1	**Acute renal failure:** Etiology, Pathology & pathogenesis, clinical features, diagnosis and management. Causes of renal failure. Outline the consequences of renal failure. Common diseases and causes of renal failure, including infections, autoimmune disorders, renal carcinomas, obstructive and congenital disorders. Difference between acute and chronic renal failure.	7
2	**Chronic Renal Failure:** Etiology, Pathology & pathogenesis, clinical features, diagnosis and management.	4
3	**Glomerular Diseases:** Pathogenesis, Clinical features, related investigations and management (Conservative and active).	4
4	**Tubulo-Interstitial Diseases:** Pathogenesis, Clinical features, related investigations and management (Conservative and active).	4
5	**Renal hypertension:** Pathogenesis, Clinical features, related investigations and management (Conservative and active).	4
6	**Renal stone:** Pathogenesis, Clinical features, related investigations and management (Conservative and active)	4
7	**Hypertension:** Pathogenesis, Clinical features, related investigations and management (Conservative and active).	4
8	**Diseases of Urogenital Tract:** Pathogenesis, Clinical features, related investigations and management (Conservative and active).	4
9	**Malignancies of Urinary system:** Pathogenesis, Clinical features, related investigations and management (Conservative and active).	4
10	**Renal Transplant:** Role of transplantation. Different types of donor organ. History of transplantation. Cadaveric, related and unrelated live donation of organs. Retrieval, transport and storage of organs.	6
Total		**45 hrs**

Recommended Text Books:

1. Diseases of Kidney
2. Dialysis Technology – A Manual for Dialysis Technicians by Jim Curtis, Philip Varghese

Reference books or related websites:

1. National Kidney foundation,
2. NANT

Name of the Programme	M.Sc. Medical Dialysis Technology
Name of the Course	Clinical Nephrology
Course Code	MMDT 107 L

Course Outcome	• The students are provided with adequate knowledge of patient assessment in renal diseases. • The students are trained to apply knowledge of laboratory & imaging investigations for diagnosing renal diseases.

Sr. No.	Topics	No. of Hrs.
1	**Medical Abbreviations:** Common medical abbreviations.	2
2	**Introduction to the patient and chart:** Patient encounter, Interview and history taking of patient.	3
3	**Vital signs:** Assessing Pulse - Radial, Brachial, Apical & Femoral Assessing Respiration - Normal rhythm and rate, Common disorders Assessing Blood Pressure - Normal values, Hyper and hypotension, Assessing Temperature - Methods, Common abnormalities.	5
4	**Inspection:** Inspection of whole body of the patient e.g. Chest, abdomen, pedal edema & Facial edema. Significance of edema as per the dialysis patient concern	4
5	**Palpation and percussion:** Palpation – Method for palpation. Percussion - Resonance, hyper-resonance and dullness.	2
6	**Auscultation:** Heart sounds & murmurs & any other abnormal body sound.	2
7	**Common findings in disease:** Glomerular Diseases, Tubulo-Interstitial Diseases, Diseases of Urogenital Tract, Malignancies of Urinary system.	3
8	**Patient assessment in:** Acute & Chronic Renal Failure.	2
9	**Examination of gastrointestinal system**	1
10	**Examination of Nervous system**	1
11	**Routine hematology:** WBC (Normal values, Leucocytoses, Leukopenia), RBC, Hematocrit, Hemoglobin, Blood indices.	3
12`	**Blood chemistry profiles:** Electrolytes (Sodium, Potassium, Chloride, Calcium) Blood glucose, Bilirubin, Blood Urea Nitrogen (BUN), Serum Creatinine. Cardiac markers – CPK, LDH, SGOT, Troponin I/T, Homocysteine.	3
13	**Routine Sputum examination**	3
14	**Routine Urine examination:** Physical & Microscopic characteristic of urine in different pathological condition	3
15	**Arterial Blood Gases Analysis:** Acid-base Chemistry (H^+ concentration, Moles, Milli moles, nano moles, Exponent system, Logarithm scale, Concept of pH), Henderson-Hasselbach Equation for Arterial Blood, HCO_3^- / H_2CO3^- ratio, Acidosis,	3

	Alkalosis, Compensatory Mechanism, Interpretation of ABGs, Causes of acid-base Disturbances, Acidosis (Respiratory, Metabolic, Alkalosis) , Respiratory acid-base Disorders (Hypoventilation, Hyperventilation, Underlying causes, Treatment) Metabolic Acid-base disorders (Metabolic Acidosis- Renal failure, Lactic Acidosis, Keto acidosis, Diarrhea. Treatment of each disorder, Metabolic Alkalosis – Hypokalemia, K^+- H^+ relationship, Effect on ECG, Other causes, Treatment). ABGs in Chronic Lung Diseases - Chronic Ventillatory Failure, Acute Ventillatory. Failure superimposed on Chronic Failure, Acute hyperventilation superimposed on Chronic Failure.	
16	**Renal Radiography:** Basic Assessment of X'Ray - Physics of X-Rays, Penetration and mediums- Air, Water, Bones, Metal, Common Radiologic evaluations and rationale- A-P view, PA view, Lateral, Other, CAT scan, MRI, Fluoroscopy. Common Terms in X-ray interpretations - Opacity, Translucency, Penetration, Patient position, Silhouette sign, Infiltrates, Bony Structures, Fatty mass, Tumors. Interpretation of X-rays - Normal film, renal Shadow, AP vs PA, hypo or hypertrophy, renal stone.	5
	Total	**45 hrs**

MMDT 107 P- Clinical Nephrology

Sr. No.	Topics	No. of Hrs.
1	**Laboratory Exercises (Practical):** 1. Vital Signs (Pulse, Blood Pressure, Temperature, Respiratory Rate, Pulse Oximetry). 2. Examination of the Chest (Inspection, Percussion, Palpation, Auscultation). 3. Laboratory Tests - Reference ranges and interpretation of abnormal values, Arterial Blood Gases.	30
Total		**30 hrs**

Books Recommended:

1. Diseases of Kidney
2. Dialysis Technology – A Manual for Dialysis Technicians by Jim Curtis, Philip Varghese.

Name of the Programme	M.Sc. Medical Dialysis Technology
Name of the Course	Dialysis Equipment
Course Code	MMDT 108 L

Course Outcome	• To understand the principle of working, construction, operation, uses, cleaning, handling, care, common trouble shooting, maintenance etc of the hemodialysis & peritoneal dialysis equipment • To conduct routine equipment management procedures including preventative maintenance, faultfinding, calibration and verifying of equipment prior to clinical use.

Sr. No.	Topics	No. of Hrs.
1	Protocol for the equipment to be maintained/calibrated	3
2	Routine preventative maintenance checks and their frequency.	
3	Correct calibration of equipment for the intended activities	4
4	Range of tests and test equipment associated with maintenance and diagnosis of faults on dialysis equipment.	
5	Suitable tests to verify safety, accuracy and operational effectiveness of equipment, including electrical safety	4
6	Principles of operation, function and expected performance	
7	Methods of verifying the calibrations carried out.	3
8	The basis and methods behind electrical safety tests.	
9	Complete planned or preventive maintenance of equipment to specified schedule.	5
10	The calibrations and tests to be performed, including calibrating the UF, conductivity, temperature and flow control systems.	
11	Potential for maintenance-induced faults.	4
12	Diagnose routine or common faults in dialysis equipment and relevant corrective action	
13	Identify faults or risks outside of own area of expertise and initiate relevant action.	5
14	Common faults in dialysis equipment and relevant corrective action.	
15	Use of equipment and PC based diagnostic systems.	5
16	The risks associated with unsafe or non-maintained equipment.	
17	Perform routine maintenance checks on water treatment system.	4
18	Importance of microbiological and chemical monitoring and disinfection	

19	Obtain suitable samples for QA testing using appropriate sampling	3
20	Method of operation, maintenance, testing and trouble-shooting of water treatment	
21	Sanitization procedures for the equipment.	5
22	Type and range of samples that is required for QA.	
23	Relevant sampling techniques and how to apply them.	
	Total	**45 hrs**

MMDT 108 P- Dialysis Equipments

Sr. No.	Topics	No. of Hrs.
1	**Machine Service And Repair:** Repair techniques and procedures, Fault diagnostics, Computer aided maintenance Planned preventative maintenance, Hospital / Community, Decalcification, Cleaning Disinfection, Infection control, Dialysis Chairs, Other renal equipment, associated medical equipment.	8
2	**Dialysate and dialysate delivery system:** preparation, Delivery system – batch type and proportioning type, Drake Willock, Centry, Gambrom, Fresenius etc., Maintenance and trouble shooting, Acetate, Bicarbonate.	8
3	**Dailysate supply subsystems:** Water pre-treatment – Water pressure regulation – Temperature control – Temperature sensors – Chemical proportioning – Degasing flow and negative pressure control – Monitors. Conductivity cell – chemical concentration monitor – Temperature compensation – Temperature monitors – Pressure monitors – Flow - Rate monitors – Blood leak monitors – Readout devices – Alarms.	8
4	**Dialysis machine maintenance:** Maintenance / - Repairing and servicing / - Drake-Winlock proportioning unit	6
Total		**30 hrs**

Books Recommended:

1. Dialysis Technology – A Manual for Dialysis Technicians by Jim Curtis, Philip Varughese.
2. Introduction to Biomedical Equipment Technology by Joseph J.Carr, John m. Brown

Course code- MMDT 109 CP: MMDT Directed Clinical Education – II

Trainees acquire the knowledge and procedural skills necessary to deliver a high standard of care to the patients with chronic kidney disease requiring renal replacement therapy. **(Total- 225 hrs)**

Name of the Programme	**M.Sc. Medical Dialysis Technology**
Name of the Course	**Research Methodology & Biostatistics (Core Course)**
Course Code	**CC 001 L**

Course Outcome	Student will be able to understand develop statistical models, research designs with the understating of background theory of various commonly used statistical techniques as well as analysis interpretation & reporting of results and use of statistical software.

Sr. No.	Topics	No. of Hrs.
A	**Research Methodology:**	
1	Scientific Methods of Research: Definition of Research, Assumptions, Operations and Aims of Scientific Research. Research Process, Significance and Criteria of Good Research , Research Methods versus Methodology, Different Steps in Writing Report, Technique of Interpretation, Precaution in interpretation, Significance of Report Writing, Layout of the Research Report	5
2	Research Designs: Observational Studies: Descriptive, explanatory, and exploratory, Experimental Studies: Pre-test design, post-test design, Follow-up or longitudinal design, Cohort Studies, Case Control Studies, Cross sectional studies, Intervention studies, Panel Studies.	5
3	Sampling Designs: Census and Sample Survey, Implications of a Sample Design, Steps in Sampling Design Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, Different Types of Sample Designs (Probability sampling and non probability sampling), How to Select a Random Sample?, Systematic sampling, Stratified sampling, Cluster sampling, Area sampling, Multi-stage sampling, Sampling with probability proportional to size, Sequential sampling.	5
4	Measurement in research: Measurement Scales, Sources of Error in Measurement, Tests of Sound Measurement, Technique of Developing Measurement Tools, Scaling Meaning of Scaling, Scale Classification Bases, Important Scaling Techniques, Scale Construction Techniques, Possible sources of error in measurement, Tests of sound Measurement	5
5	Methods of Data Collection: Types of data, Collection of Primary Data, Observation Method, Interview Method, Collection of Primary Data	5
6	Sampling Fundamentals : Need and importance for Sampling, Central Limit Theorem, Sampling Theory, Concept of Standard Error, Estimation, Estimating the Population Mean Estimating Population Proportion, Sample Size and its Determination, Determination of Sample Size through the Approach Based on Precision Rate and Confidence Level.	5
B	**Biostatistics**	
7	Data Presentation: Types of numerical data: Nominal, Ordinal, Ranked, Discrete and continuous. Tables: Frequency distributions, Relative frequency, Graph: Bar charts, Histograms, Frequency polygons, one way scatter plots, Box plots, two way scatter	3

	plots, line graphs	
8	Measures of Central Tendency and Dispersion: Mean, Median, Mode Range, Inter quartile range, variance and Standard Deviation, Coefficient of variation, grouped mean and grouped standard deviation (including merits and demerits).	3
9	Testing of Hypotheses: Definition, Basic Concepts, Procedure for Hypothesis Testing, Measuring the Power of a Hypothesis Test, Normal distribution, data transformationImportant Parametric Tests, Hypothesis Testing of Means, Hypothesis Testing for Differences between Means, Hypothesis Testing for Comparing Two Related Samples, Hypothesis Testing of Proportions, Hypothesis Testing for Difference between Proportions, Hypothesis Testing for Comparing a Variance to Some Hypothesized Population Variance, Testing the Equality of Variances of Two Normal Populations.	6
10	Chi-square Test: Chi-square as a Non-parametric Test, Conditions for the Application Chi-square test, Steps Involved in Applying Chi-square Test, Alternative Formula, Yates' Correction, and Coefficient by Contingency.	2
11	Measures of Relationship: Need and meaning, Correlation and Simple Regression Analysis	2
12	Analysis of Variance and Covariance: Analysis of Variance (ANOVA):Concept and technique of ANOVA, One-way ANOVA, Two-way ANOVA, ANOVA in Latin-Square Design Analysis of Co-variance (ANOCOVA), ANOCOVA Technique.	4
13	Nonparametric or Distribution-free Tests: Important Nonparametric or Distribution-free Test Sign test, Wilcoxon signed-Rank Test, Wilcoxon Rank Sum Test: Mann-Whitney U test Kruskal Walli's test, Friedman's test, and Spearman Correlation test.	3
14	Vital Health Statistics: Measurement of Population: rate, crude rate, specific rate, Measurement of fertility: specific fertility rate, Total fertility rate, Reproduction rate, Gross Reproduction Rate, Net Reproduction Rate, Measures related to mortality: Crude Death Rate (CDR), Age-specific death Rate, Infant and child mortality rate, Measures related to morbidity.	4
15	Computer Application Use of Computer in data analysis and research, Use of Software and Statistical package. Introduction to SPSS. Importing data from excel, access, tab and comma separated files. Entering data, labeling a variable, coding and recoding a categorical and continuous variable. Converting data from string to numeric variables, sorting & filtering, merging, appending data sets. Frequencies, descriptive statistics, cross tabulations. Diagrammatic presentation include histogram, bar chart, pie chart, scatter diagram, box plot, line chart. Parametric test of hypothesis-one sample, Independent and paired sample t test, one way ANOVA& post HOC test. Testing for normality,Chi-square test with measures of association. Pearson correlation. Non parametric test.	3
Total		**60 hrs**

CC 001P –Research Methodology & Biostatistics

Sr. No.	Topics	No. of Hrs
A	**Research Methodology**	
1	Sampling Designs	4
2	Measurement in research	5
3	Methods of Data Collection	3
4	Sampling Fundamentals	3
B	**Biostatistics**	
5	Data Presentation	4
6	Measures of Central Tendency and Dispersion	4
7	Testing of Hypotheses	12
8	Chi-square Test	2
9	Measures of Relationship	3
10	Analysis of Variance and Covariance	4
11	Nonparametric or Distribution-free Tests	4
12	Vital Health Statistics: Measurement of Population	6
13	Computer Application Using Statistical Software	6
Total		**60 hrs**

CORE ELECTIVE COURSES

Name of the Programme	**M.Sc. Medical Dialysis Technology**
Name of the Course	**Basics of Clinical Skills Learning**
Course Code	**CEC 001 L**

Course Outcome	• After successful accomplishment of the course, the students would be able to Measure Vital Signs, do basic physical Examination of the patients, NG tube basics, Administration of Medicines • The students will learn about Asepsis, and the Cleanliness related to asepsis and on mobility of the patients

Sr. No.	Topics	No. of Hrs.
1	**MEASURING VITAL SIGNS:** Temperature: Axillaries Temperature, Pulse: Sites of pulse, Measurement, Respiratory, Blood Pressure, Pain: Pain Scale	5
2	**PHYSICAL EXAMINATION:** Observation, Auscultation(Chest), Palpation, Percussion, History Taking	10
3	**FEEDING: ENTRAL FEEDING, NG TUBE:** Measurement, Procedure, Care, Removal of Nasal-Gastric Tube, Nasal-Gastric Tube Feeding, and Parenteral Nutrition.	10
4	**ADMINISTRATIONS:** Oral, Intravenous, Intramuscular, Subcutaneous, Recapping of Syringe, Loading of Drugs, Calculation of Drugs, Venipuncture, IV Infusion, Cannula, Attachment of IV infusion Set, Fluid Collection, Heparin Lock, Maintenance of IV set, Performing Nebulizer Therapy, Inhaler, Oxygen Therapy (Nasal, prongs, nasal Catheter, Venturi Mask, face mask)	10
5	**ASEPSIS:** Hand wash Techniques,(Medical, Surgical) Universal Precaution, Protecting Equipment: Using Sterile Gloves, Opening a Sterile package and Establishing a Sterile Field, Sterile Dressing Changes, Surgical Attire ,Wound Dressing, Suture Removal, Cleaning and Application of Sterile Dressing, Wearing and Removal of personal protective Equipment	5
6	**MOBILITY AND SUPPORT:** Moving and Positioning, range of Motion exercises (Active & Passive) Assisting for Transfer, Application of Restraints	5
Total		**45 hrs**

Name of the Programme	**M.Sc. Medical Dialysis Technology**
Name of the Course	**Hospital Operation Management**
Course Code	**CEC 002 L**

Course Outcomes	• Understand and apply resource management concepts (personnel, finance, and material resources) and the processes and strategies needed in specific hospital sectors • Communicate effectively and develop their leadership and teambuilding abilities • Apply modern change management and innovation management concepts to optimize structures • Analyze existing hospital service policies and enhance their alignment within the local and national context

Sr. No.	Topics	No. of Hrs.
1	**MEDICO-LEGAL CASES:** Introduction, Laws associated with Medico-Legal Cases, Three Core Contents in Medico-legal cases w.r.t Doctors, Patient & Profession,	5
2	**CONSIDERATIONS OF ETHICS:** Consent, Confidentiality, Mental Health, End of life and Organ Transportation, Research & Clinical Trials	10
3	**HOSPITAL INFORMATION SYSTEM(HIS):** Hospital Information System Management, software applications in registration, billing, investigations, reporting, medical records management, Security and ethical challenges	10
4	**EQUIPMENT OPERATIONS MANAGEMENT:** Hospital equipment repair and maintenance, types of maintenance, job orders, equipment maintenance log books, AMCS	10
5	**ROLE OF MEDICAL RECORDS IN HEALTH CARE MANAGEMENT:** Computers for Medical records, Developments of computerized medical record information processing system(EMR's), Computer stored (Vs) Manual hand written record, Advantages of EMR (Vs) Manual	10
Total		**45 hrs**

Model Checklist for Evaluation of the Clinical Directed Posting (PG)

Name of the student:_____ **Date:**_____
Program:_____
Semester: _____ **Name of the Internal faculty/Observer:**_____
Name of the External Faculty/Observer:

Core Competencies	Marks allotted	Marks obtained
Students will begin to develop critical thinking abilities utilizing the allied health personnel roles of communicator and caregiver. Students will learn principles of professional allied health personnel practice and provide direct care to individuals within a medical surgical setting while recognizing the diverse uniqueness of individuals with health alterations.		
Clinical Teaching		
a. Demonstrate beginning competency in technical skills.	10	
Independent Work by Student guided by faculty		
a. Develop effective communication skills (verbally and through charting) with patients, team members, and family	2.5	
b. Identify intra and inter-professional team member roles and scopes of practice. Establish appropriate relationships with team members.	2.5	
Hands on practical work by students		
a. Protect confidentiality of electronic/manual health records data, information, and knowledge of technology in an ethical manner	05	
Independent work by student		
a. Demonstrate expected behaviors and complete tasks in a timely manner. Arrive to clinical experiences at assigned times. Maintain professional behavior and appearance.	05	
Log book	10	
Viva	10	
Attendance	05	
Total	**50 Marks**	

Sign of Internal Examiner:_____
Sign of External Examiner:_____

Scheme of University Examination Theory for PG Program:

General structure / patterns for setting up question papers for Theory / Practical courses, their evaluation weightages for PG programs of MGMSBS are given in the following tables

2.2 a Marks scheme for the University exam:

Final theory marks will be 10**0 marks (80 marks University Theory exam + 20 Marks Internal assessment).**

Question		Marks distribution	Marks allotted per section	Marks
Sec:A	MCQ	10 x 1 M = 10	10	10
Sec:B	SAQ	3/4x 5 M = 15	15	35
Sec:B	LAQ	2/3 x 10 M = 10	20	
Sec:C	SAQ	3/4x 5 M = 15	15	35
Sec:C	LAQ	2/3x 10 M = 10	20	
				Total = 80 M

2.2 b Practical exam pattern: Total 40 marks with following breakup :

Exercise	Description	Marks
Q No 1	Practical exercise - 1	1 x20=20 M
Q No 2	Station exercise	2x5M=10 M
Q No 3	VIVA	10 M
QNo 4	Journal	NIL
		Total = 40 M

2.2 c Practical to be conducted at respective departments and marks submitted jointly by the parent department to the university.

2.2 d Breakup of theory IA calculation for 20 marks

Internal exam (at department)	15 marks
Seminar	5 marks
	Total = 20 M

Breakup of practical IA calculation:

Internal exam (at department)	10 marks
Viva	5 marks
Journal	5 marks
	Total = 20 M

Note –20 marks to be converted to 10 marks weightage for submission to the university.

Resolution No. 4.2 of Academic Council (AC-42/2022): Resolved to accept the syllabus for IIIrd & IVth Semester M.Sc. Medical Dialysis Technology (MDT) for batch admitted in AY 2021-22 onwards. [ANNEXURE-43]

CHOICE BASED CREDIT SYSTEM (CBCS)

With effect from Academic Year 2021 – 22

Curriculum for

M.Sc. Medical Dialysis Technology
Second year
(Semester III & IV)

Outline of Course Curriculum															
M.Sc. Medical Dialysis Technology															
Semester III															
code no.	core course	credits/week					Hrs/semester					Marks			
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posting/ Rotation (CP)	Total credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posting/ Rotation (CP)	Total (hrs)	Internal Assessment (IA)	Semester end exam (SEE)	Total
Theory															
MMDT 110 L	Concepts of Kidney Diseases	3				3	45				45	20	80	100
MMDT 111 L	Dialysis Technology	4				4	60				60	20	80	100
MMDT 112 L	Renal Transplantation & Co-ordination	4				4	60				60	20	80	100
MMDT 113 CP	MMDT Directed Clinical Education – III				21	7				315	315		50	50
MMDT 114	Dissertation / Project	10				5						50		50
Practical															
MMDT 110 P	Concepts of Kidney Diseases			2		1			30		30	10	40	50
Core Elective Course															
CEC 001	Imaging Science of the Urinary System	3				3	45				45	20	80	100
CEC 002	Hospital Operation Management														
Total		**24**	**0**	**2**	**21**	**27**	**210**	**0**	**30**	**315**	**555**	**140**	**410**	**550**

Outline of Course Curriculum															
M.Sc. Medical Dialysis Technology															
Semester IV															
code no.	core course	credits/week					Hrs/semester					Marks			
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posting/ Rotation (CP)	Total credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posting/ Rotation (CP)	Total hrs	Internal Assessment (IA)	Semester end exam (SEE)	Total
Theory															
MMDT 115	Nutrition in Renal Disease	2				2	30				30	20	80	100
MMDT 116 L	Recent Advances in Dialysis and Nephrology	3				3	45				45	20	80	100
General Elective															
GE 001 L	Pursuit of Inner Self Excellence (POISE)	4				4	60				60	20	80	100
GE 002 L	Bioethics, Biosafety, IPR & Technology transfer														
GE 003 L	Disaster Management and Mitigation Resources														
GE 004 L	Human Rights														
Practical															
MMDT 117	Dissertation / Project			36		18							200	200
Total		**9**		**36**		**27**	**135**				**135**	**60**	**440**	**500**

SECOND YEAR

M.Sc. Medical Dialysis Technology

SEMESTER-III

Code No.	Core Subjects
Theory	
MMDT 110 L	Concepts of Kidney Diseases
MMDT 111 L	Dialysis Technology
MMDT 112 L	Renal Transplantation & Co-ordination
MMDT 113 CP	MMDT Directed Clinical Education–III
MMDT 114	Dissertation/ Project
Practical	
MMDT 110 P	Concepts of Kidney Diseases
Core Elective Course	
CEC 001 L	Imaging Science of the Urinary System
CEC 002 L	Hospital Operation Management

Name of the Program	**M.Sc. Medical Dialysis Technology**
Name of the Course	**Concepts of Kidney Diseases**
Course Code	**MMDT 110 L**

Course Outcome	• The candidate should be able to understand the various aspects of renal ailments. He should be able to identify signs of renal disease in order to be able to refer the patient to an appropriate care provider. • The candidate should have observed all the clinical procedures performed for the care of a patient with a renal ailment.

Sr. No.	**Topics**	**No. of Hrs.**
1	Patient Assessment	2
2	Clinical Syndromes	1
3	Glomerular Diseases	4
4	Non – glomerular Parenchymal Renal Diseases	4
5	Acute Kidney Injury	7
6	Chronic Kidney Disease	7
7	Hypertension	4
8	Diabetes Mellitus	4
9	Acid-Base Disorders	4
10	Fluid and Electrolyte Disorders	4
11	Urological Diseases	4
	Total (Hours)	45

MMDT 110 P - Concepts of Kidney Diseases

Sr.No.	Topics	No. of Hrs.
1	Clinical procedures in renal ailments	30
Total		**30**

Reference Text Books:

1. **Harrison's Principles of Internal Medicine, 20e**
2. **Manual of Nephrology, Robert Schrier**

Reference books or related websites: Oxford Handbook of Nephrology, 2e

Name of the Program	**M.Sc. Medical Dialysis Technology**
Name of the Course	**Dialysis Technology**
Course Code	**MMDT 111 L**

Course Outcome	• The candidate will be able to understand the design and function of each component of the dialysis machine. • The candidate can further provide his or her assistance in the dialysis technology industry and be a liaison between the manufacturing and healthcare industry.

Sr. No.	**Topics**	**No. of Hrs.**
1.	Intermittent and Continuous Extracorporeal Therapies	6
2.	Peritoneal Dialysis	6
3.	Components of the hemodialysis machine	6
4.	Dialysate Proportioning System of Hemodialysis Machine	6
5.	Alarms and Pressure gauges of Hemodialysis Machine	6
6.	Hemodialysis Solutions for Intermittent and Continuous Therapies	6
7.	Components of CRRT Machine	6
8.	Components of Automated Peritoneal Dialysis Machine	6
9.	Peritoneal Dialysis Fluids	6
10.	Other Extracorporeal Therapies	6
Total (Hrs)		**60**

Reference Text Books:

1. **John T. Daugirdus, Handbook of Dialysis, 7e,**
2. **Nissonsen, Handbook of Dialysis**
3. **Henrich, Textbook of Dialysis, 5e**

Name of the Program	**M.Sc. Medical Dialysis Technology**
Name of the Course	**Renal Transplantation & Co-ordination**
Course Code	**MMDT 112 L**

Course Outcome	• The candidate will be able to counsel and educate the patients with chronic kidney disease regarding the various aspects of renal transplantation. • The candidate can pursue the field of being a coordinator in a renal transplantation program.

Sr. No.	**Topics**	**No. of Hrs.**
1	History of Transplantation	6
2.	Introduction to the immune system	6
3.	Tissue and Human Organs Act and Rules	6
4.	Evaluation of the donor	6
5.	Evaluation of the recipient	6
6.	Immune related evaluation of donor and recipient	6
7.	Deceased donor renal transplantation	6
8.	Transplant surgery + potential complications	6
9.	Immunosuppressive therapy	6
10.	Graft rejection	6
Total (Hrs)		**60**

Reference Text Books:

1. Danovitch, Manual of Renal Transplantation, 6e,

2. Peter Morris, Renal Transplantation. 9e

Course code-MMDT 113 CP: MMDT Directed Clinical Education–III

Students will gain additional skills in dialysis procedures, renal science and recent advancements. Students apply knowledge from previous clinical learning experience under the supervision of a senior technologist. **(Total-315 hrs)**

Name of the Program	**M.Sc. Medical Dialysis Technology**
Course Code	**MMDT 114**
Name of the Course	**Dissertation/Project**

***The Dissertation work will begin from 3rd Semester, and will continue through the 4th Semester.**

Name of the Program	**M.Sc. Medical Dialysis Technology**
Name of the Course	**Imaging Science of the Urinary System**
Course Code	**CEC 001 L**

Course Outcome	• Candidate will be able to understand different modalities of renal imaging thereby be able to educate the patient and be able to satisfy the patient's queries.

Sr. No.	**Topics**	**No. of Hrs.**
1	Evaluation of renal function and diagnostic tests	5
2	Ultrasound of the urinary system	5
3	Computed Tomography of The Kidney	5
4	Urography	5
5	Magnetic Resonance Imaging	5
6	Renal Angiography	4
7	Radionuclide Studies of Urology	4
8	Renal Biopsy and histopathology techniques	4
9	Hematological and Biochemical evaluation of renal ailments	4
10	Urinalysis – Physical, biochemical and microbiological	4
Total		45

Reference Text Books: Sutton, Textbook of Radiology and Imaging, 7e

Name of the Program	**M.Sc. Medical Dialysis Technology**
Name of the Course	**Hospital Operation Management**
Course Code	**CEC 002 L**

Course Outcomes	• Understand and apply resource management concepts (personnel, finance, and material resources) and the processes and strategies needed in specific hospital sectors. • Communicate effectively and develop their leadership and team building abilities • Apply modern change management and innovation management concepts to optimize structures. • Analyze existing hospital service policies and enhance their alignment within the local and national context

Sr. No.	Topics	No. of Hrs.
1	**MEDICO-LEGAL CASES:** Introduction, Laws associated with Medico-Legal Cases, Three Core Contents in Medico-legal cases w.r.t Doctors, Patient & Profession.	5
2	**CONSIDERATIONS OF ETHICS:** Consent, Confidentiality, Mental Health, End of life and Organ Transportation, Research & Clinical Trials	10
3	**HOSPITAL INFORMATION SYSTEM (HIS):** Hospital Information System Management, Software applications in registration, billing, investigations, reporting, medical records management, Security and ethical challenges.	10
4	**EQUIPMENT OPERATIONS MANAGEMENT:** Hospital equipment repair and maintenance, types of maintenance, job orders, equipment maintenance log books, AMCS	10
5	**ROLE OF MEDICAL RECORDS IN HEALTHCARE MANAGEMENT:** Computers For Medical records, Developments of computerized medical record information processing System (EMR's), Computer stored (Vs) Manual hand written record, Advantages of EMR (Vs) Manual	10
Total		**45hrs**

M.Sc. Medical Dialysis Technology

SEMESTER-IV

Code No.	Core Subjects
Theory	
MMDT 115 L	Nutrition in Renal Disease
MMDT 116 L	Recent Advances in Dialysis and Nephrology
General Elective**	
GE001 L	Pursuit of Inner Self Excellence (POISE)
GE002 L	Bioethics, Biosafety, IPR & Technology transfer
GE003 L	Disaster Management and Mitigation Resources
GE004 L	Human Rights
Practical	
MMDT 117	Dissertation/Project

*(a) **Dissertation / Project Course** commences in III Semester

(Elective): Any one subject is to be chosen from the following (Subjects offered may change from time to time depending on the availability of expertise)

**Elective courses may or may not have practical and/or field work.

▲Multidisciplinary/ Interdisciplinary

Name of the Program	**M.Sc. Medical Dialysis Technology**
Name of the Course	**Nutrition in Renal Disease**
Course Code	**MMDT 115 L**

Course Outcome	• To describe basic nutrient and their role in growth, development and maintenance of good health • To understand the patho-physiology of various renal disorders. • To explain the interrelationship between the disease conditions and nutritional status. • To understand the therapeutic role of diet vis-à-vis the severity and medical management. • To identify and interpret appropriate dietary plan for dialysis patient.

Sr. No.	Topics	No. of Hrs.
1	**Basic concepts of nutrition:** Food groups, balanced diet, RDA trough lifestyle, Food pyramid, Body composition,	3
2	**Macronutrients and Micronutrients:** types, functions, digestion absorption metabolism, functions, deficiency and toxicity. Carbohydrates, Protein, Fat, Vitamins and minerals, Water and electrolytes.	5
3	**Energy:** Components of energy requirements: BMR, thermic effect of feeding, physical activity. Factors affecting energy requirements, methods of measuring energy expenditure. Estimating energy requirements of individuals.	2
4	**Nutritional status assessment:** Methods of nutritional status assessment: importance, techniques, advantages and limitations, nutritional status assessment indices Anthropometric assessment Biochemical assessment Clinical assessment Dietary assessment	6
5	**Nutritional (and dietary) Care Process** A) In health - Depending on the state of growth & development of the individual - at various activity levels and socioeconomic status. B) In disease - Nutritional screening/ assessment and identification of nutritional problem - Nutritional Intervention and Diet Modification based on interpretation of - Patient data - clinical, biochemical and other relevant data	4

	- Nutrition Education and Counseling -Evaluation of Nutritional care 1 Delivery of Nutritional Support – Meeting nutritional needs A. Enteral tube feeding, Different Enteral feeding access routes, Practical Aspects B. Parenteral nutrition	
6	**Medical nutrition therapy for renal diseases:** Nutrition in Renal Diseases and Disorders – Physiology and function of normal kidney – A brief review - Classification of kidney diseases a). Glomerulo-Nephritis Etiology, characteristics Objectives, Principles of dietary treatment and management b). Nephrotic Syndrome Etiology, Objectives, Principles of dietary treatment and management c). Uremic Renal Failure i) History, General importance of protein nutrition in renal failure and uremia ii) Causes and Dietary management in Acute Renal Disease iii) Causes and Dietary management in Chronic Renal Disease iv) Dietary modification in chronic renal disease with complications v) Sodium and Potassium Exchange list d) Types of dialysis and their nutritional care– Hemodialysis, CAPD, Continuous Ambulatory peritoneal dialysis) e) Renal Transplant and its nutritional care f) Nephrolithiases- etiology, types of stones and nutritional care (acid & alkaline ash diet) g) Chronic renal disease in Children	10
Total		**30hrs**

Recommended learning Resources/Text Books:

1. Jelliffe, D. B.: Assessment of the Nutritional Status of the Community; World Health Organization.
2. Mahan, L.K. and Escott- Stump, S. (2000): Krause's Food Nutrition and Diet Therapy, 10th Edition, W.B. Saunders Ltd.
3. Shils, M.E., Olson, J.A., Shike, M. and Ross, A.C. (1999): Modern Nutrition in Health and Disease, 9th Edition, Williams and Wilkins.
4. Williams, S.R. (1993): Nutrition and Diet Therapy, 7th Edition, Times Mirror/Mosby College Publishing.

Name of the Program	**M.Sc. Medical Dialysis Technology**
Name of the Course	**Recent Advances in Dialysis and Nephrology**
Course Code	**MMDT 116 L**

Course Outcome	• The candidate will be able to counsel and educate the patients with chronic kidney disease regarding the various aspects of renal transplantation. • The candidate can pursue the field of being a coordinator in a renal transplantation program.

Sr. No.	**Topics**	**No. of Hrs.**
1	Online Clearance Monitoring	9
2.	Recent Advances in Hemodialysis	9
3.	Recent Advances in Vascular Access	9
4.	Recent Advances in Peritoneal Dialysis	9
5.	Recent Advances in Renal Transplantation	9
Total (Hrs)		**45**

Reference Text Books:

1. **Daugridas J. T. Handbook of dialysis technology, 7e**
2. **Danovitch, Handbook of Renal Transplantation, 6e**

ACADEMIC SYLLABUS FOR SEMESTER-IV
ELECTIVE COURSE

Name of the Program	**M.Sc. Medical Dialysis Technology**
Course Code	**GE 001 L**
Name of the Course	**PURSUIT OF INNER SELF EXCELLENCE (POISE)**

Course out comes	1. Students will become self dependent, more decisive and develop intuitive ability for their study and career related matter. 2. Students ability to present their ideas will be developed. 3. Enhanced communication skills, public speaking & improved Presentation ability. 4. Students will be able to explore their inner potential and inner ability to become a successful researcher or technician & hence become more focused. 5. Students will observe significant reduction in stress level. 6. With the development of personal attributes like Empathy, Compassion, Service, Love & brotherhood, students will serve the society and industry in better way with teamwork and thus grow professionally.

Unit no.	Topics	No. of Hrs
1	**Spiritual Values for human excellence :** The value of human integration; Compassion, universal love and brotherhood (Universal Prayer) ;Heart based living ; Silence and its values, Peace and non-violence in thought, word and deed ; Ancient treasure of values - Shatsampatti, Patanjali's Ashtanga Yoga, Vedic education-The role of the Acharya, values drawn from various cultures and religious practices- Ubuntu, Buddism, etc.: Why spirituality? Concept–significance:Thought culture	**15**
2	**Ways and Means :** Correlation between the values and the subjects ;Different teaching techniques to impart value education; Introduction to Brighter Minds initiative; Principles of Communication; Inspiration from the lives of Masters for spiritual values- Role of the living Master	**15**
3	**Integrating spiritual values and life:** Relevance of VBSE (Value Based Spiritual Education) in contemporary life; Significant spiritual values; Spiritual destiny; Principles Of Self-management; Designing destiny	**15**
4	**Experiencing through the heart for self-transformation (Heartfulness Meditation):** Who am I? ; Introduction to Relaxation; Why, what and how HFN Meditation?; Journal writing for Self-Observation; Why, what and how HFN Rejuvenation(Cleaning)?; Why, what and how HFN connect to Self (Prayer)?; Pursuit of inner self excellence; Collective Consciousness – concept of *egregore effect;*	**15**
Total		**60hrs**

Reference Books:

1. www.pdfdrive.net
2. www.khanacademy.org
3. www.acadeicearths.org
4. www.edx.org
5. www.open2study.com
6. www.academicjournals.o

Name of the Program	**M.Sc. Medical Dialysis Technology**
Course Code	**GE 002 L**
Name of the Course	**BIOETHICS, BIOSAFETY, IPR & TECHNOLOGY TRANSFER**

Course outcomes	Students will learn to: 1. Effectively manage the health and safety aspects of a biological laboratory. 2. Give reliable, professional and informed advice and information to colleagues and managers. 3. Help to ensure that their institution complies with relevant legislation, liaise effectively with enforcing authorities and beware of the penalties for failing to comply. 4. Build a context of understanding through communication. 5. Mediate between other conflicting parties. 6. Exhibit de – escalatory behavior sin situations of conflict. 7. Demonstrate acknowledgment and validation of the feelings, opinions, and contributions of others.

Unit no.	Topics	No of Hrs
1	**Ethics**: Benefits of Allied Health Sciences, ELSI of Bioscience, recombinant therapeutic products for human healthcare, genetic modifications and food consumption, release of genetically engineered organisms, applications of human genetic rDNA research, human embryonic stem cell research.	**15**
2	**Patenting:** Patent and Trademark, Bio science products and processes, Intellectual property rights, Plant breeders rights, trade marks, industrial designs, copyright biotechnology in developing countries. Biosafety and its implementation, Quality control in Biotechnology.	**15**
3	**Introduction to quality assurance, accreditation & SOP writing :**Concept of ISO standards and certification, National regulatory body for accreditation, Quality parameters, GMP& GLP, Standard operating procedures, Application of QA in field of genetics, Data management of clonical and testing laboratory.	**15**
4	**Funding Agencies** (Financing alternatives, VC funding, funding for Bioscience in India, Exit strategy, licensing strategies, valuation), support mechanisms for entrepreneurship (Bio-entrepreneurship efforts in India, difficulties in India experienced, organizations supporting growth, areas of scope, funding agencies in India, policy initiatives), Role of knowledge centers and R&D (knowledge centers like universities and research institutions, role of technology and up gradation)	**15**
Total		**60 hrs**

ReferenceBooks:

1. www.pdfdrive.net
2. www.khanacademy.org
3. www.acadeicearths.org
4. www.edx.org
5. www.open2study.com
6. www.academicjournals.org

Name of the Program	**M.Sc. Medical Dialysis Technology**
Course Code	**GE 003 L**
Name of the Course	**DISASTER MANAGEMENT AND MITIGATION RESOURCES**

Course outcomes	At the successful completion of course the student will gain: 1. Knowledge and understanding of the disaster phenomenon, its different contextual aspects, impacts and public health consequences. 2. Knowledge and understanding of the International Strategy for Disaster Reduction (UNISDR) and to increase skills and abilities for implementing the Disaster Risk Reduction (DRR) Strategy. 3. Ensure skills and abilities to analyze potential effects of disasters and of the strategies and methods to deliver public health response to avert these effects.

Unit no.	Topics	No of Hrs.
1	**Introduction:** Definition of Disaster, hazard, global and Indian scenario, general perspective, importance of study in human life, Direct and indirect effects of disasters, long term effects of disasters. Introduction to global warming and climate change.	08
2	**Natural Disaster and Manmade disasters:** Natural Disaster: Meaning and nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion Manmade Disasters: Chemical, Industrial, Nuclear and Fire Hazards. Role of growing population and subsequent industrialization, urbanization and changing life style of human beings in frequent occurrences of manmade disasters.	15
3	**Disaster Management, Policy and Administration:** Disaster management: meaning, concept, importance, objective of disaster management policy, disaster risks in India, Paradigm shift in disaster management. Policy and administration: Importance and principles of disaster management policies, command and co-ordination of in disaster management, rescue operations-how to start with and how to proceed in due course of time, study of flow charts howing the entire process.	12
4	**Financing Relief Measures:** Ways to raise finance for relief expenditure, role of government agencies and NGO's in this process, Legal aspects related to finance raising as well as overall management of disasters. Various NGO's and the works they have carried out in the past on the occurrence of various disasters, Ways to approach these teams. International relief aid agencies and their role in extreme events.	13
5	**Preventive and Mitigation Measures:** Pre-disaster, during disaster and post-disaster measures in some events in general structural mapping: Risk mapping, assessment and analysis, sea walls and embankments, Bio shield, shelters, early warning and communication Non Structural Mitigation: Community based disaster preparedness, risk transfer and risk financing, capacity development and training, awareness and education, contingency plans. Do's and don'ts in case of disasters and effective implementation of relief aids.	12
Total		**60hrs**

Reference Books:

1. Shailendra K. Singh: Safety & Risk Management, Mittal Publishers
2. J. H. Diwan :Safety, Security & Risk Management, APH
3. Stephen Ayers & Garmvik: Text Book of Critical Care, Holbook and Shoemaker
4. www.pdfdrive.net
5. www.khanacademy.org
6. www.acadeicearths.org
7. www.edx.org
8. www.open2study.com
9. www.academicjournals.org

Name of the Program	**M.Sc. Medical Dialysis Technology**
Course Code	**GE 004 L**
Name of the Course	**HUMAN RIGHTS**

Course outcomes	Student will be able to virtue: 1. identify, contextualize and use information about the human rights situation in a given country 2. critically appraise source material, including cases from human rights committees and tribunals and reports and summary records from treaty bodies 3. analyze a country's situation or an international situation in terms of human rights and formulate human rights-based initiatives and policies 4. Promote human rights through legal as well as non-legal means. 5. Participate in legal, political and other debates involving human rights in acknowledgeable and constructive way

Unit no.	Topics	No. of Hrs
1	*Background*: Introduction, Meaning, Nature and Scope, Development of Human Rights, Theories of Rights, Types of Rights	08
2	*Human rights at various level*: Human Rights at Global Level UNO, Human Rights – UDHR 1948– UN Conventions on Human Rights: International Covenant on civil and Political Rights 1966, International Convent on Economic, Social and Cultural Right, Racial Discrimination -1966 International, Instruments: U.N. Commission for Human Rights, European Convention on Human Rights.	15
3	*Human rights in India*: Development of Human Rights in India, Human Rights and the Constitution of India, Protection of Human Rights Act 1993- National Human Rights Commission, State Human Rights Commission, Composition Powers and Functions, National Commission for Minorities, SC/ST and Woman	12
4	*Human Rights Violations*: Human Rights Violations against Women, Human Rights Violations against Children, 35 Human Rights Violations against Minorities SC/ST and Trans-genders, Preventive Measures.	13
5	*Political issues*: Political Economic and Health Issues, Poverty, Unemployment, Corruption and Human Rights, Terrorism and Human Rights, Environment and Human Rights, Health and Human Rights	12
Total		**60hrs**

Reference Books:

1. Jagannath Mohanty Teaching of Humans Rights New Trends and Innovations Deep & Deep Publications Pvt. Ltd. New Delhi 2009
2. Ram Ahuja: Violence Against Women Rawat Publications Jewahar Nager Jaipur. 1998.
3. Sivagami Parmasivam Human Rights Salem 2008
4. Hingorani R. C. : Human Rights in India: Oxford and IBA New Delhi.

Name of the Program	**M.Sc. Medical Dialysis Technology**
Course Code	**MMDT 117**
Name of the Course	**DISSERTATION/PROJECT WORK**

1. Dissertation/Project work should be carried out as an individual Dissertation and actual bench work.

2. The students will carry independent project work under the supervision of the staff of Department on an advanced topic assigned to him/her. In house projects are encouraged. Students may be allowed to carry out the project work in other Departmental laboratories/ Research institutes / Industries as per the availability of Infrastructure.

3. Co guides from the other institutions maybe allowed.

4. The Dissertation/ Project work will begin from 3rd Semester, and will continue through the 4th Semester.

5. The Dissertation/ Project report (also work book shall be presented at the time of presentation and viva voce) will be submitted at the end of the 4th Semester and evaluated.

6. Five copies of the project report shall be submitted to the Director, SBS.

7. For the conduct of the End Semester Examination and evaluation of Dissertation/ Project work the University will appoint External Examiners.

8. Since the dissertation is by research, Dissertation/ Project work carries a total of 250 marks and evaluation will be carried out by both internal and external evaluators.

9. The student has to defend his/her Dissertation/Project Work in a seminar which will be evaluated by an internal and external experts appointed by the University.

10. The assignment of marks for Project/ Dissertation is as follows:

    Part I -

    Topic Selection, Review of Literature, Novelty of works-50 marks

    Part II-

    a. Continuous Internal Assessment, Novelty, Overall Lab Work Culture- 100Marks

    b. Dissertation/ Project work book: 50 Marks

    c. Viva- Voce: 50 Marks

d. However, a student in 4th semester will have to opt for general elective course from other related disciplines in addition to his Dissertation/ Project work in the parent department.

MONITORINGLEARNINGPROGRESS

It is essential to monitor the learning progress of each candidate through continuous appraisal and regular assessment. It not only also helps teachers to evaluate students, but also students to evaluate themselves. The monitoring be done by the staff of the department based on participation of students in various teaching/ learning activities. It may be structured and assessment be done using checklists that assess various aspects. Model Check lists are attached

The learning out comes to be assessed should include:

i) **Journal Review Meeting (Journal Club):** The ability to do literature search, in depth study, presentation skills, and use of audio- visual aids are to be assessed. The assessment is made by faculty members and peers attending the meeting using a checklist (see Model Checklist–I)

ii) **Seminars / Symposia**: The topics should be assigned to the student well in advance to facilitate in depth study. The ability to do literature search, in depth study, presentation skills and use of audio- visual aids are to be assessed using a checklist (see Model Checklist-II)

iii) **Teaching skills**: Candidates should be encouraged to teach undergraduate medical students and paramedical students, if any. This performance should be based on assessment by the faculty members of the department and from feedback from the undergraduate students (See Model checklist-III,)

iv) **Work diary/ Log Book**-Every candidate shall maintain a work diary and record his/ her participation in the training programs conducted by the department such as journal, reviews, seminars, etc. Special mention may be made of the presentations by the candidate as well as details of experiments or laboratory procedures, if any conducted by the candidate.

v) **Records**: Records, log books and marks obtained intests will be maintained by the Head of the Department.

Resolution No. 10.4 of Academic Council (AC-42/2022):

i) "Resolved to accept "50% eligibility in internal assessment" pattern for all the CBCS programs (UG & PG) running under the constituent units of MGMIHS.(MGM School of Biomedical Sciences, MGM School of Physiotherapy, MGM Medical College (M.Sc. Medical 3 year courses).

This will be applicable to all existing batches (for remaining regular examinations) and forthcoming batches from June 2022 onwards"

Resolution No. 3.10 of Academic Council (AC-49/2024):

Resolved and approved to collect the Dissertations/Projects 60 days before the University examination for all 2-year M.Sc. programs under MGM School of Biomedical Sciences to fulfil the credit allotted for project work, to be effective from batch 2023-24 onwards.

MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A' Accredited by NAAC

Sector-01, Kamothe, Navi Mumbai - 410209

Tel 022-27432471, 022-27432994, Fax 022-27431094

E-mail- registrar@mgmuhs.com Website : www.mgmuhs.com