NAGALAND UNIVERSITY

APPROVED CURRICULUM

REGULATION AND SYLLABUS FOR
Bachelor of Dialysis Therapy Technology (BDTT)

REFERENCE: "Curriculum Handbook of Dialysis Technology and Dialysis Therapy (Intellectual Property of the National Commission for Allied and Healthcare Professions, Ministry of Health and Family Welfare)"

Introduction:

Learning Objectives:

At the completion of this program, the student should be –

1. Function as a Dialysis Therapy Technologist in a stand-alone dialysis unit as well as in a hospital with a dialysis facility that provides dialysis treatment/extra corporeal therapies to individuals diagnosed with acute or chronic kidney disease and other non-renal indications.
2. Understand and apply the principles of dialysis and the skills necessary to deliver safe and effective care to the individual undergoing dialysis treatments.
3. Demonstrate the use of hemodialysis equipment with an understanding of the process of operating dialysis equipment and alternate dialysis procedures.
4. Assess the patient for any complications with an understanding of the problem and recognize the complications thereby delivering the apt management & treatments under the supervision of the supervisor in a standalone unit or the physician/nephrologist in a hospital.
5. Respond effectively to the physical and emotional needs of the patient undergoing dialysis treatment.
6. Develop the ability to understand the operation, routine maintenance, identification of malfunction in equipment, troubleshooting, and minor repair in equipment used in daily units such as hemodialysis machines, water treatment plants, dialyzer reprocessing machines, etc.
7. Demonstrate renal transplant coordination with the transplantation team.

Scope of Curriculum & Expectation from the future graduate in the providing patient care.

1. The primary goal of the Bachelor of Dialysis Therapy Technology program is to prepare accomplished professionals in renal replacement therapies with a specific emphasis on clinical skills and knowledge of dialysis therapies.
2. The students acquire the knowledge and procedural skills necessary to deliver a high standard of care to patients with chronic kidney disease requiring renal replacement therapy.
3. They will also receive training to conduct research in the field of dialysis.
4. This program involves all aspects of care for patients undergoing chronic hemodialysis and continuous ambulatory peritoneal dialysis (CAPD), renal transplant coordination as well as RRTs in the intensive care unit.
5. The overall goal of this training is to foster the trainee‟s development into an independent care provider in the field of dialysis. 6. The program intends for its graduates to contribute to a new generation of academic dialysis professionals equipped to address the challenging problems in renal replacement therapy & Other Extracorporeal Therapies.

Eligibility for admission:

Selection procedure:

1. Universities can consider NEET appeared candidates along with 50% in 10+2 science (PCB)
2. The candidate should have attained the age of 17 years as of the current year.
3. University/State entrance examination for admissions in the allied and healthcare programs.

- Students from other boards without English as a compulsory subject may be encouraged to pick English as an elective from available resources on Swayam and similar platforms. The completion of the course will not lead to any university course credit (non-university course).

Provision of Lateral Entry:

For the students who have successfully completed Diploma in Dialysis Technology from a government recognized university, they can directly enter into the second year or 3rd semester.

Duration of the Program:

1. Duration of the program is 4 years or 8 semesters (inclusive of one year of internship) with 1545 hours of Lecture & 2115 hours of Practical Training and another 2160 hours dedicated for internship and 180 hours dedicated for Dissertation/Project.

a. Total number of hours – 6000

b. Total Credits: 216

- The maximum duration of this course shall be N+2 where N is the normal duration of the programme. No student shall be allowed to continue beyond the maximum duration.

Medium of instruction:

1. English shall be the medium of instruction for all the subjects of study and for examination of the course.

Attendance: A candidate has to secure minimum 80% attendance in the following categories-

1. 80% attendance in theoretical
2. 100% in Skills training (practical) for qualifying to appear for the final examination.

No relaxation, whatsoever, will be permissible to this rule under any ground including indisposition, etc.

Assessment:

1. Cognitive Assessment
2. Structured logbook
3. Viva-voce examination.
4. Structured case presentation
5. Formative assessment
6. Summative assessment
7. Case presentation

Psychomotor Assessment:

1. Objective Structured Clinical Examination (OSCE)
2. Objective Structured Practical Examination (OSPE)
3. Mini Clinical Evaluation Exercise (Mini-CEX)
4. Direct Observation of Procedural Skills (DOPS)
5. Simulation-based assessment

Marks qualifying for a pass:

For End Semester Examination subjects: 50% in internal assessment, 50% in theory examination, 50% in practical examination and 50% in aggregate.

Submission of Log Books:

1. At the time of practical examination, each candidate shall submit to the examiners his / her Log book duly certified by the Head of the Department as a bona fide record of the work done by the candidate.
2. The practical record shall be evaluated by the concerned Head of the Department (Internal Evaluator) and the practical record marks shall be submitted to the University 15 days prior to the commencement of the theory Examinations.
3. In respect of failed candidates, the marks awarded for record at previous examination will be carried over for the subsequent examination. The candidates shall have the option to

improve his performance by submission of fresh records.

Revaluation / Retotaling of Answer Papers:

1. There is no provision for candidates to request for revaluation of the answer papers of failed candidates in any examination. However, the failed candidates can apply for retotaling.
2. The Academic Committee shall constitute a moderation committee of 3 members each year. Moderation of marks cannot exceed 5 marks for any one candidate for all papers combined.

Internship Project:

As part of the internship, students are required to choose a relevant subject and prepare an in-depth project report, which should include the objective, scope of the project, and a detailed report.

Eligibility Criteria for End-Semester Examinations:

A student is deemed qualified to appear at the end-semester examinations only if they secure minimum qualifying marks as in section above in the Internal Assessment Tests and maintain 80% attendance in each subject.

Advancement to the Next Semester:

Advancement to the next semester is contingent upon meeting the following condition and clearing any backlogs as described:

- A student may not fail in more than two papers in the preceding semester to be eligible to advance to the next semester.

Repeat examination for failed candidates:

Failed papers in odd semesters can be retaken during the exams of the subsequent odd semester. Similarly, failed papers in even semesters exams can be retaken during the subsequent even semester exams.

Vacation:

Maximum of 4 weeks in each semester
OR
Maximum of 30 days including Saturdays and Sundays

Re-admission after break of study:

Students shall be allowed to continue after break in studies provided the maximum duration as given in the Clause- ‘Duration of the Program’ is not exceeded.

Award of the Degree:

a. Candidates who have passed all written examinations and successfully completed the compulsory internship as per the university's requirements will be awarded the degree.
b. Final Consolidated Mark sheet shall be issued to the candidate after submission of his/her Internship Completion Certificate by the College.

Curriculum and Syllabi

Nagaland University shall provide separate curriculum and syllabus for each Allied Health Science Course. The approval and modification of the curriculum and syllabi shall be as per the norms and procedure of the University.

Academic Calendar

a. Odd semester shall be from July to December, and Even semester shall be from January to June.
b. The odd semester and even semester university (end) examinations shall be conducted in the months of December and June respectively.

Curriculum Scheme:

Semester I

Course Code	Course	Result in Group (RG) #	Credit/ Week				Hours/ Semester			Attendance %	Continuous Internal assessment CIA- Theory/ Practical (a)	End Semester		Grand Total
			Lecture	Tutorial/ Clinical Training	Practical/ Research Project	Credits	Lecture	Practical/ Tutorial	Total Hours			Theory (b)	Practical/ Viva (c)	Theory: a+(b÷2) =100 Practical: a + c =100
BDTT -001	Medical Terminology and Record keeping (including anatomical terms)		2			2	30		30	80	100			100
BDTT -002	Professionalism and values & Indian Constitution		2			2	30		30	80	100			100
BDTT -003	Human Anatomy	A	4	1		5	60	30	90	80	50	100		100
BDTT -004	Human Physiology	B	4	1		5	60	30	90	80	50	100		100
BDTT -005	Biochemistry	C	4	1		5	60	30	90	80	50	100		100
BDTT -006	Introduction to Dialysis Therapy		1	1		2	15	30	45	80	50	100		100
BDTT -007	Human Anatomy (Practicals)	A			2	2		60	60	80	50		50	100
BDTT -008	Human Physiology (Practicals)	B			2	2		60	60	80	50		50	100
BDTT -009	Biochemistry (Practicals)	C			2	2		60	60	80	50		50	100
BDTT -010	Community orientation and clinical visit (CT)			2		2		90	90	80	100			100
Total			**17**	**6**	**6**	**29**	**255**	**390**	**645**		**650**	**400**	**150**	**1000**

Semester II														
			Credit/ Week				Hours/ Semester					End Semester		Grand Total
Course Code	Course	Result in Group (RG) #	Lecture	Tutorial/ Clinical Training	Practical/ Research Project	Credits	Lecture	Practical/ Tutorial	Total Hours	Attendance %	Continuous Internal assessment CIA- Theory/ Practical (a)	Theory (b)	Practical/ Viva (c)	Theory: a+(b÷2) =100 Practical: a + c =100
BDTT -011	Pathology	E	4			4	60		60	80	50	100		100
BDTT -012	Microbiology	F	4			4	60		60	80	50	100		100
BDTT -013	General Pharmacology		4			4	60		60	80	50	100		100
BDTT -014	Applied anatomy & physiology related to Dialysis Therapy	G	4			4	60		60	80	50	100		100
BDTT -015	Fundamentals of Dialysis Therapy	H	3			3	45		45	80	50	100		100
BDTT -016	Pathology (Practicals)	E			1	1		30	30	80	50		50	100
BDTT -017	Microbiology (Practicals)	F			1	1		30	30	80	50		50	100
BDTT -018	Applied anatomy & physiology related to Dialysis Therapy (Practicals)	G			1	1		30	30	80	50		50	100
BDTT -019	Fundamentals of Dialysis Therapy (Practicals)	H			1	1		30	30	80	50		50	100
BDTT -020	Clinical Postings I (CT)			3		3		135	135	80	50		50	100
Total			**19**	**3**	**4**	**26**	**285**	**255**	**540**		**500**	**500**	**250**	**1000**

Semester III														
			Credit/ Week				Hours/ Semester					End Semester		Grand Total
Course Code	Course	Result in Group (RG) #	Lecture	Tutorial/ Clinical Training	Practical/ Research Project	Credits	Lecture	Practical/ Tutorial	Total Hours	Attendance %	Continuous Internal assessment CIA- Theory/ Practical (a)	Theory (b)	Practical/ Viva (c)	Theory: a+(b÷2) =100 Practical: a + c =100
BDTT-021	Sociology in Health Care		3			3	45		45	80	100			100
BDTT-022	Biomedical Waste Management		2			2	30		30	80	100			100
BDTT-023	Pathophysiology of the kidney diseases		3	1		4	45	30	75	80	50	100		100
	Elective Course (To be chosen by the student)													
BDTT-024	Instrumentation Specific to Dialysis Therapy	I	3	1		4	45	30	75	80	50	100		100
BDTT-025	Basic Principles of Nursing Care		3	0		3	45	0	45	80	100			100
BDTT-026	Medical Law and Ethics		2			2	30		30	80	100			100
BDTT-027	Instrumentation Specific to Dialysis Therapy (Practicals)	I			2	2		60	60	80	50		50	100
BDTT-028	Clinical Postings II (CT)			4		4		180	180	80	50		50	100
Total			**16**	**6**	**2**	**24**	**240**	**300**	**540**		**600**	**100**	**100**	**800**

Semester IV														
			Credit/ Week				Hours/ Semester					End Semester		Grand Total
Course Code	Course	Result in Group (RG) #	Lecture	Tutorial/ Clinical Training	Practical/ Research Project	Credits	Lecture	Practical/ Tutorial	Total Hours	Attendance %	Continuous Internal assessment CIA- Theory/ Practical (a)	Theory (b)	Practical/ Viva (c)	Theory: a+(b÷2) =100 Practical: a + c =100
BDTT-029	Pharmacology related to Dialysis therapy	J	2	1		3	30	30	60	80	50	100		100
BDTT-030	Psychology		3			3	45		45	80	50	100		100
BDTT-031	Renal Nutrition		3			3	45		45	80	50	100		100
BDTT-032	Dialysis Therapies – Part I	K	3	1		4	45	30	75	80	50	100		100
BDTT-033	Medical Electronics for Health Sciences		3			3	45		45	80	50	100		100
BDTT-034	Research Methodology and Biostatistics		4			4	60		60	80	50	100		100
BDTT-035	Pharmacology related to Dialysis therapy (Practicals)	J			2	2		60	60	80	50	100		100
BDTT-036	Dialysis Therapies – Part I (Practicals)	K			2	2		60	60	80	50		50	100
BDTT-037	Clinical Postings III (CT)			4		4		180	180	80	50		50	100
Total			**18**	**6**	**4**	**28**	**270**	**360**	**630**		**450**	**700**	**100**	**900**

Semester V

Course Code	Course	Result in Group (RG) #	Credit/ Week				Hours/ Semester			Attendance %	Continuous Internal assessment CIA- Theory/ Practical (a)	End Semester Assessment		Grand Total
			Lecture	Tutorial/ Clinical Training	Practical/ Research Project	Credits	Lecture	Practical/ Tutorial	Total Hours			Theory (b)	Practical/ Viva (c)	Theory: a+(b÷2) =100 Practical: a + c =100
BDTT-038	Dialysis Therapies – Part II	L	4			4	60		60	80	50	100		100
BDTT-039	Renal Transplantation and Coordination	M	4			4	60		60	80	50	100		100
BDTT-040	Clinical Problems and Evidenced Based Practise in Dialysis Therapy		4			4	60		60	80	50	100		100
BDTT-041	Advanced Extracorporeal Therapies	N	4			4	60		60	80	50	100		100
	Elective Course (To be chosen by the student)													
BDTT-042	Renal Transplantation and Coordination (Practicals)	M			2	2		60	60	80	50		50	100
BDTT-043	Advanced Extracorporeal Therapies (Practicals)	N			2	2		60	60	80	50		50	100
BDTT-044	Dialysis Therapies – Part II (Practicals)	L			2	2		60	60	80	50		50	100
BDTT-045	Clinical Postings IV (CT)			4		4		180	180	80	50		50	100
Total			16	4	6	26	240	360	600		400	400	200	800

Semester VI

Course Code	Course	Result in Group (RG) #	Credit/ Week				Hours/ Semester			Attendance %	Continuous Internal assessment CIA- Theory/ Practical (a)	End Semester		Grand Total
			Lecture	Tutorial/ Clinical Training	Practical/ Research Project	Credits	Lecture	Practical/ Tutorial	Total Hours			Theory (b)	Practical/ Viva (c)	Theory: a+(b÷2) =100 Practical: a + c =100
BDTT-046	Recent Advancements in Renal replacement therapies	O	4	1		5	60	30	90	80	50	100		100
BDTT-047	Principals of Management		3			3	45		45	80	50	100		100
BDTT-048	Introduction to Quality Assurance in dialysis and Patient safety		3	1		4	45	30	75	80	50	100		100
BDTT-049	Basic and Advanced Cardiac Life Support	P	2			2	30		30	80	50	100		100
	Elective Course (To be chosen by the student)													
BDTT-050	Recent Advancements in Renal replacement therapies (Practicals)	O			2	2		60	60	80	50		50	100
BDTT-051	Basic and Advanced Cardiac Life Support (Practicals)	P			1	1		30	30	80	50		50	100
BDTT-052	Clinical Postings V (CT)			6		6		270	270	80	50		50	100
Total			12	8	3	23	180	420	600		350	400	150	700

Semester VII

Course Code	Course	Result in Group (RG) #	Credit/ Week				Hours/ Semester			Attendance %	Continuous Internal assessment CIA- Theory/ Practical (a)	End Semester		Grand Total
			Lecture	Tutorial/ Clinical Training	Practical/ Research Project	Credits	Lecture	Practical/ Tutorial	Total Hours			Theory (b)	Practical/ Viva (c)	Theory: a+(b÷2) =100 Practical: a + c =100
BDTT-053	Compulsory Rotatory Internship			24		24		1080	1080	100	100			100
Total				**24**		**24**		**1080**	**1080**		**100**			**100**

Semester VIII

Course Code	Course	Result in Group (RG) #	Credit/ Week				Hours/ Semester			Attendance %	Continuous Internal assessment CIA- Theory/ Practical (a)	End Semester		Grand Total
			Lecture	Tutorial/ Clinical Training	Practical/ Research Project	Credits	Lecture	Practical/ Tutorial	Total Hours			Theory (b)	Practical/ Viva (c)	Theory: a+(b÷2) =100 Practical: a + c =100
BDTT-054	Compulsory Rotatory Internship			24		24		1080	1080	100	50		50	100
BDTT-055	Dissertation/Project				6	6		180	180	90	50		50	100
Total				24	6	30		1260	1260		100		100	200

Elective Course

Course Code	Course	Result in Group (RG) #	Credit/ Week				Hours/ Semester			Attendance %	Continuous Internal assessment CIA- Theory/ Practical (a)	End Semester		Grand Total
			Lecture	Tutorial/ Clinical Training	Practical/ Research Project	Credits	Lecture	Practical/ Tutorial	Total Hours			Theory (b)	Practical/ Viva (c)	Theory: a+(b÷2) =100 Practical: a + c =100
BDTT-056	Introduction to Healthcare Delivery System in India		2			2	30		30	80	100			100
BDTT-057	Basic computers and information Science		1		1	2	15	30	45	80	100			100
BDTT-058	Communication and soft skills		2			2	30		30	80	100			100
Total			5	0	1	6	75	30	105		300			300
Grand Total			**103**	**81**	**32**	**216**	**1545**	**4455**	**6000**		**3450**	**2500**	**1050**	**5800**

Results in Group (RG) – For Programs wherein Theory and Practicals are assessed jointly (RG), the passing minimum for the theory exams and Practical exams have to be obtained separately, in order to be declared passed in the individual courses and thereby earning the credits for both Theory and Practical courses. Reappearance in any one of the components (Theory or Practical) is treated as reappear in both these components (Theory and Practical's).

Contents of the subjects

FIRST SEMESTER

Medical terminologies and record keeping (30 Hours)

This course introduces the elements of medical terminology. Emphasis is placed on building familiarity with medical words through knowledge of roots, prefixes, and suffixes. Topics include origin, word building, abbreviations and symbols, terminology related to the human anatomy, reading medical orders and reports, and terminology specific to the student's field of study. Spelling is critical and will be counted when grading tests. Topics to be covered under the subject are as follows:

1. Derivation of medical terms. - Origin, uses and purpose of medical terminology
2. Word roots, prefixes, and suffixes. - Musculo-skeletal system, respiratory system, cardiovascular system, Digestive system, Endocrine system, Central Nervous system, Urinary system, Reproductive system, Organs of special sense and Integumentary system. prefixes and pseudo prefixes used in medical terminology, suffixes and pseudo suffixes used in medical terminology.
3. Conventions for combined morphemes and the formation of plurals.
4. Basic anatomical medical terms.
5. Form medical terms utilizing roots, suffixes, prefixes, and combining roots.
6. Interpret basic medical abbreviations/symbols.
7. Utilize diagnostic, surgical, and procedural terms and abbreviations related to the integumentary system, musculoskeletal system, respiratory system, cardiovascular system, nervous system, and endocrine system.
8. Interpret medical orders/reports.
9. Formats and Contents of medical records
10. Data entry and management on electronic health record system.

Professionalism and Values & Indian Constitution (30 Hours)

Part A: Professionalism and Values

The course on professionalism will deliver the concept of what it means to be a professional and how a specialized profession is different from a usual vocation. It also explains how relevant professionalism in terms of healthcare system is and how it affects the overall patient environment.

1. Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality
2. Personal values- ethical or moral values
3. Attitude and behavior- professional behavior, treating people equally.
4. Code of conduct, professional accountability and responsibility, misconduct
5. Differences between professions and importance of team efforts.
6. Cultural issues in the healthcare environment

Part B: Indian Constitution

The course on Indian Constitution provides understanding of knowledge of the Indian constitution. Familiarize students with the fundamental rights and duties. Understand the importance of constitutional laws. Understand the correlation between Indian constitution, democracy, and society.

1. Meaning of the term, 'Constitution'. Making of the Indian Constitution 1946- 1950.
2. The democratic institutions created by the constitution, bicameral system of Legislature at the Centre and in the States.
3. Fundamental rights and duties their content and significance.
4. Directive principles of States, policies need to balance fundamental rights with directive

principles.
5. Special rights created in the Constitution for Dalits, backwards, women and children and the religious and linguistic minorities.
6. Doctrine of Separation of Powers, legislative, executive, and judicial and their functioning in India.
7. The Election Commission and State Public Service commissions.
8. Method of amending the Constitution.
9. Enforcing rights through writs.
10. Constitution and sustainable development in India.

Human Anatomy (90 Hours)

1. Introduction: Human body as a whole
   a. Definition of anatomy and its divisions.
   b. Terms of location, positions, and planes.
   c. Cell and its organelles.
   d. Epithelium: definition, classification, describe with examples, function.
   e. Glands: classification, describe serous, mucous & mixed glands with examples.
   f. Basic tissues: classification with examples
2. Locomotion and support
   a. Cartilage: types with example & histology.
   b. Bone: classification, names of bone cells, parts of long bone, microscopy of compact bone, names of all bones, vertebral column, inter-vertebral disc, fontanelles of fetal skull.
   c. Joints: classification of joints with examples, synovial joint (in detail for radiology).
   d. Muscular system: classification of muscular tissue & histology, names of muscles of the body.
3. Cardiovascular system
   a. Heart: size, location, chambers, exterior & interior, blood supply of heart.
   b. Systemic & pulmonary circulation, branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery, peripheral pulse, inferior vena cava, portal vein, porto systemic anastomosis, great saphenous vein, dural venous sinuses. Lymphatic system: cisterna chyli & thoracic duct, histology of lymphatic tissues, names of regional lymphatics, axillary and inguinal lymph nodes in brief. Anatomy correlated to vascular access to be emphasized.
4. Gastro-intestinal system
   a. Parts of GIT, oral cavity, lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Waldeyer‟s ring, esophagus, stomach, small and large intestine, liver, gall bladder, pancreas, radiographs of abdomen.
5. Respiratory system
   a. Parts of RS, nose, nasal cavity, larynx, trachea, lungs, broncho-pulmonary segments, histology of trachea, lung and pleura, names of paranasal air sinuses.
6. Peritoneum
   a. Description in brief.
7. Urinary system
   a. Kidney, ureter, urinary bladder, male and female urethra. Histology of kidney, ureter and urinary bladder.
8. Reproductive system
   a. Parts of male reproductive system, testis, vas deferens, epididymis, prostate (gross & histology). Parts of female reproductive system, uterus, fallopian tubes, ovary (gross & histology). Mammary gland: gross.
9. Endocrine glands
   a. Endocrine glands: pituitary gland, thyroid gland, parathyroid gland, suprarenal glad (gross & histology).

10. Nervous system
    a. Neuron, classification of nervous system, cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord with spinal nerve (gross & histology), meninges, ventricles & cerebrospinal fluid, names of basal nuclei, blood supply of brain, cranial nerves.
    b. Sympathetic trunk & names of parasympathetic ganglia.
11. Sensory organs
    a. Skin: histology, appendages of skin.
    b. Eye: parts of eye & lacrimal apparatus. Extra-ocular muscles & nerve supply.
    c. Parts of ear: external, middle and inner ear and contents.
12. Embryology:
    a. Spermatogenesis & oogenesis.
    b. Ovulation, fertilization.
    c. Fetal circulation.
    d. Placenta.

Human Physiology (90 Hours)

1. Blood:
    a. Introduction: composition and function of blood.
    b. Red blood cells: erythropoiesis, stages of differentiation, function, count, physiological variation.
    c. Structure, function, concentration, physiological variation, methods of estimation of hemoglobin.
    d. White blood cells: production, function, life span, count, differential count.
    e. Platelets: origin, normal count, morphology functions. f.
    f. Plasma proteins: production, concentration, types, functions, albumin, globulin, fibrinogen, prothrombin.
    g. Hemostasis: definition, normal hemostasis, clotting factors, mechanism of clotting, disorders of clotting factors.
    h. Blood bank:
        i. Blood groups: ABO system, Rh system.
        ii. Blood grouping & typing, cross matching.
        iii. Rh system: Rh factor, Rh incompatibility.
        iv. Blood transfusion: indication, universal donor and recipient concept.
        v. Selection criteria of a blood donor, transfusion reactions.
    i. Anticoagulants: classification, examples and uses.
    j. Anemias: morphological and etiological classification, effects of anemia on body.
    k. Blood indices: colour index, MCH, MCV, and MCHC.
    l. Erythrocyte sedimentation rate (ESR) and packed cell volume, normal values, definition, determination.
    m. Blood volume: normal value, determination of blood volume and regulation of blood volume.
    n. Body fluid: pH, normal value, regulation and variation.
    o. Lymph: lymphoid tissue formation, circulation, composition and function of lymph
2. Cardiovascular system
    a. Heart: physiological anatomy, nerve supply.

   b. Properties of cardiac muscle, cardiac cycle: systole, diastole. Intra-ventricular pressure curves.
   c. Cardiac output (only definition).
   d. Heart sounds, normal heart sounds, areas of auscultation.
   e. Blood pressure: definition, normal value, clinical measurement of blood pressure.
   f. Physiological variations, regulation of heart rate, cardiac shock, hypotension, hypertension
   g. Pulse: jugular, radial pulse, triple response.
   h. Heart sounds: normal heart sounds, causes, characteristics and significance, heart rate.
   i. Electrocardiogram (ECG) significance.
3. Digestive System
   a. Physiological anatomy of gastrointestinal tract, functions of digestive system.
   b. Salivary glands: structure and functions, deglutition: stages and regulation
   c. Stomach: structure and functions.
   d. Gastric secretion: composition function regulation of gastric juice secretion.
   e. Pancreas: structure, function, composition, regulation of pancreatic juice.
   f. Functions of liver. Bile secretion, composition, function, regulation of bile secretion, bilirubin metabolism, types of bilirubin, Vandenberg reaction, jaundice: types, significance.
   g. Functions of gall bladder.
   h. Small intestine: functions, digestion, absorption, movements.
   i. Large intestine: functions, digestion and absorption of carbohydrates, proteins, fats, lipids, defecation
4. Respiratory
   a. Functions of respiratory system, physiological anatomy of respiratory system, respiratory tract, respiratory muscles.
   b. Respiratory organs: lungs, alveoli, respiratory membrane, stages of respiration
   c. Mechanism of normal and rigorous respiration, forces opposing and favoring expansion of the lungs. Intra pulmonary pleural pressure, surface tension, recoil tendency of the wall.
   d. Transportation of respiratory gases: transportation of oxygen: direction, pressure gradient, forms of transportation, oxygenation of Hb. Quantity of oxygen transported. Lung volumes and capacities
   e. Regulation of respiration: mechanisms of regulation, nervous and chemical regulation, respiratory center, Hering–Breuer reflex.
   f. Applied physiology and respiration: hypoxia, cyanosis, asphyxia, dyspnea, dysbarism, artificial respiration, and apnea.
5. Endocrine
   a. Definition, classification of endocrine glands & their hormones, properties of hormones.
   b. Thyroid gland hormone: physiological anatomy, hormone secreted, physiological function, regulation of secretion, disorders: hypo and hyper secretion of hormone.
   c. Adrenal cortex: physiological anatomy of adrenal gland, adrenal cortex, cortical hormones, functions and regulation.

   d. Adrenal medulla: hormones, regulation and secretion. Functions of adrenaline and nor adrenaline.
   e. Pituitary hormones: anterior and posterior pituitary hormones, secretion, function.
   f. Hormones of pancreas. g.
   g. Insulin: secretion, regulation, function and action.
   h. Diabetes mellitus: regulation of blood glucose level
   i. Parathyroid gland: function, action, regulation of secretion of parathyroid hormone
   j. Calcitonin: function and action.
6. Special senses
   a. Vision: structure of eye, function of different parts.
   b. Structure of retina.
   c. Hearing: structure and function of ear, mechanism of hearing.
   d. Taste buds: functions.
   e. Smell: physiology, receptors.
7. Nervous system
   a. Functions of nervous system, neuron: structure, classification and properties.
   b. Neuroglia, nerve fiber, classification, conduction of impulses continuous and saltatory.
   c. Velocity of impulse transmission and factors affecting.
   d. Synapse: structure, types, properties.
   e. Receptors: definition, classification, properties.
   f. Reflex action: unconditioned properties of reflex action. Babinski‟s sign.
   g. Spinal cord nerve tracts. Ascending tracts, descending tracts.
   h. Pyramidal tracts
      i. Extrapyramidal tracts, functions of medulla, pons, hypothalamic disorders.
      ii. Cerebral cortex lobes and functions, sensory cortex, motor cortex, cerebellum, functions of cerebellum.
      iii. Basal ganglion: functions. EEG.
      iv. Cerebro Spinal Fluid (CSF): formation, circulation, properties, composition and functions.
      v. Lumbar puncture.
   i. Autonomic Nervous System:
      i. Sympathetic and parasympathetic distribution and functions and comparison of functions.
8. Excretory System
   a. Functions of kidneys, nephron, vasa recta, cortical and juxtamedullary nephrons, comparison, juxta glomerular apparatus: structure and function. Renal circulation peculiarities.
   b. Mechanism of urine formation: ultrafiltration criteria for filtration GFR, plasma fraction,
   c. GFR, factors effecting GFR. Determination of GFR selective reabsorption –sites of reabsorption, substance reabsorbed, mechanisms of reabsorption of glucose, urea, H+, Cl- amino acids etc. TMG, tubular lead, renal threshold % of reabsorption of different substances, selective secretion.

   d. Properties and composition of normal urine, urine output. Abnormal constituents in urine, mechanism of urine concentration. Counter-current mechanisms: micturition, innervation of bladder, cystometrogram.
   e. Diuretics: water, diuretics, osmotic diuretics, artificial kidney, renal function tests: plasma clearance, actions of ADH, aldosterone and PTH on kidneys.
   f. Renal function tests.
9. Reproductive system
   a. Function of reproductive system, puberty.
   b. Male reproductive system: functions of testes, spermatogenesis: site, stages, factors influencing, semen. Endocrine functions of testes
   c. Androgens: testosterone structure and functions.
   d. Female reproductive system: ovulation, menstrual cycle: physiological changes during pregnancy, pregnancy test.
   e. Lactation: composition of milk, factors controlling lactation.
10. Muscle nerve physiology
   a. Classification of muscle, structure of skeletal muscle, sarcomere contractile proteins, neuromuscular junction. Transmission across neuromuscular junction. Excitation contraction coupling. Mechanism of muscle contraction muscle tone, fatigue, rigor mortis.
11. Skin
   a. Structure and function, body temperature measurement, physiological variation, regulation of body temperature by physical chemical and nervous mechanisms. Role of hypothalamus, hypothermia and fever.

Biochemistry (90 Hours)

1. Specimen collection: a. Pre-analytical variables. b. Collection of blood. c. Collection of CSF & other fluids. d. Urine collection. e. Use of preservatives. f. Anticoagulants.

2. Introduction to laboratory apparatus a. Pipettes: different types (graduated, volumetric, Pasteur, automatic etc.). b. Calibration of glass pipettes. c. Burettes, beakers, petri dishes, depression plates. d. Flasks: different types (volumetric, round bottomed, Erlenmeyer conical etc.). e. Funnels: different types (conical, Buchner etc.). f. Bottles: reagent bottles – graduated and common, wash bottles – different type specimen bottles

3. Measuring cylinders, porcelain dish a. Tubes: test tubes, centrifuge tubes, test tube draining rack. b. Tripod stand, wire gauze, Bunsen burner. c. Cuvettes, significance of cuvettes in colorimeter, cuvettes for visible and UV range. Cuvette holder racks: bottle, test tube, pipette, desiccator, stop watch, timers, scissors. d. Dispensers: reagent and sample. e. Maintenance of lab glass ware and apparatus. f. Glass and plastic ware in laboratory. g. Use of glass: significance of boro silicate glass, care and cleaning of glass ware, different cleaning solutions of glass. h. Care and cleaning of plastic ware, different cleaning solution.

4. Instruments (Theory and demonstration) Diagrams to be drawn a. Use, care and maintenance of: water bath, oven & incubators, water distillation plant, water deionizers, refrigerators, cold box, deep freezers, reflux condenser, centrifuge, balances, colorimeter,

spectrophotometer, pH meter and electrodes. b. Centrifuges: definition, principles, Svedberg unit, centrifugal force, centrifugal field, RPM, conversion of G to RPM and vice versa, different types of centrifuges. c. Manual balances: single pan, double pan, triple balance, direct read out electrical balances. d. Guideline to be followed and precautions to be taken while weighing. Weighing different types of chemicals, liquids, hygroscopic compounds etc. e. Colorimeter, spectrophotometer, pH meter, electrodes, salt bridge solution: principles, parts, types, guidelines to be followed and precautions to be taken while using.

5. Safety of measurements
6. Conventional and SI units

7. Atomic structure: a. Dalton‟s theory, properties of electrons, protons, neutrons, and nucleus, Rutherford‟s model of atomic structure, Bohr‟s model of atomic structure, orbit and orbital quantum numbers, Heisenberg‟s uncertainly principle. Electronic configuration, Aufbau principle. b. Pauli‟s exclusion principle, etc. c. Valency and bonds: different types of strong and weak bonds in detail with examples. d. Theory & Practical for all the following under this section: molecular weight, equivalent weight of elements and compounds, normality, molarity. Preparation of molar solutions (mole/liter solution) e.g.: 1 M NaCl, 0.15 M NaCl, 1 M NaOH, 0.1 M HCl, 0.1 M H2S04 etc. e. Preparation of normal solutions. e.g., 1N Na2CO3, O.1N Oxalic acid, 0.1 N HCl, 0.1N H2SO4, 0.66 N H2S04 etc., percent solutions. Preparation of different solutions: v/v w/v (solids, liquids and acids). Conversion of a percent solution into a molar solution.

8. Dilutions a. Diluting solutions: e.g. preparation of 0.1 N NaCl from 1 N NaCl & from 2N NaCl etc., preparing working standard from stock standard, body fluid dilutions, reagent dilution techniques, calculating the dilution of a solution, body fluid reagent etc., saturated and supersaturated solutions. Technique for preparation of standard solutions e.g.: glucose, urea, etc., significance of volumetric flask in preparing standard solutions. Volumetric flasks of different sizes, preparation of standard solutions of deliquescent compounds (CaCl2, potassium carbonate, sodium hydroxide etc.). Preparation of standards using conventional and SI unit‟s acids, bases, salts and indicators.

9. Acids and Bases: a. Definition, physical and chemical properties with examples. Arrhenius concept of acids and bases, Lowry – Bronsted theory of acids and bases. Classification of acids and bases. b. Differences between bases and alkali, acidity and basicity, monoprotic and polyprotic acids and bases. Concepts of acid base reaction, hydrogen ion concentration, ionization of water, buffer, and pH value of a solution. c. Preparation of buffer solutions using pH meter. Salts: definition, classification, water of crystallization, definition and different types, deliquescent and hygroscopic salts.

10. Acid- base indicators: a. Definition, concept, mechanism of dissociation of an indicator, color change of an indicator in acidic and basic conditions, use of standard buffer solution and indicators for pH determinations, preparation and its application, list of

commonly used indicators and their pH range, suitable pH indicators used in different titrations, universal indicators.

11. Quality control: a. Accuracy, precision. Specificity, sensitivity, limits of error allowable in laboratory, percentage error. b. Normal values and Interpretations.

12. Special Investigations: a. Serum electrophoresis, immunoglobulins, drugs: digitoxin, theophylline, regulation of acid base status, Henderson Hassel Bach equations, buffers of the fluid, pH regulation, disturbance in acid base balance, anion gap, metabolic acidosis, metabolic alkalosis, respiratory acidosis, respiratory alkalosis, basic principles and estimation of blood gases and pH, basic principles and estimation of electrolytes, water balance, sodium regulation, bicarbonate buffers, nutrition, nutritional support with special emphasis on parental nutrition, calorific value, nitrogen balance, respiratory quotient, basal metabolic rate, dietary fibers, nutritional importance of lipids, carbohydrates and proteins, vitamins.

13. Carbohydrate- properties, metabolism of fructose, Glycolysis, TCA cycle, Gluconeogenesis and its biological importance

14. Lipid- properties, metabolism and its biological importance

15. Protein - properties, metabolism, degradation of fatty acids and its biological importance

16. Nucleoproteins- chemistry, structure and function

17. Hemoglobinopathies- structure, properties and abnormal Hb

18. Enzymes- definition, classification, coenzymes, factors affecting their action, enzyme inhibition, enzymes of clinical importance.

19. Vitamins- classification, functions, source, deficiency manifestations and hypervitaminoses.

20. Bioenergetics – Importance of ATP, Mitochondria, biological oxidation, respiratory chain

21. Minerals – Ca2+, phosphorous, Na+ , Cl- , iron, Iodine and copper, water and electrolytes. Organ function tests – Liver function test, Renal Function test.

Introduction to Dialysis Therapy (45 Hours)

1. Kidney Diseases Basics AKI & CKD
2. Hemodialysis (HD)
    a. History of dialysis
    b. Define Hemodialysis
    c. Components of hemodialysis apparatus
    d. Mechanisms of hemodialysis
3. Peritoneal Dialysis (PD)

   a. History of Peritoneal Dialysis
   b. Define peritoneal dialysis.
   c. Components of peritoneal dialysis apparatus.
   d. Mechanisms of peritoneal dialysis.
4. Renal Transplantation
   a. History of organ transplantation (including Kidney)
   b. List & Define organ/tissue transplantation.
   c. Define kidney transplantation.
5. Normal Kidney & Dialysis
   a. Compare the normal kidney functions with dialysis.
   b. Indications for dialysis.
   c. Compare HD & PD
6. Conservative management
   a. Define conservative management & Palliative care.
   b. Methods of conservative management.
   c. Importance of conservative management.
   d. Palliative care for ESRD.
7. Introduction to Dialysis Unit
   a. Various areas in the dialysis unit and their importance
   b. Staff, job responsibilities
   c. Protocol to establish a dialysis unit.

Anatomy Practical's (60 Hours)

1. Introduction: Human body as a whole
   a. Histology of types of epithelium.
   b. Histology of serous, mucous & mixed salivary gland.
2. Locomotion and support
   a. Histology of the 3 types of cartilage.
   b. Demo of all bones showing parts, radiographs of normal bones & joints.
   c. Histology of compact bone (TS & LS).
   d. Demonstration of all muscles of the body.
   e. Histology of skeletal, smooth & cardiac muscle (TS & LS).

3. Cardiovascular system
    a. Demonstration of heart and vessels in the body.
    b. Histology of large artery, medium sized artery & vein, large vein.
    c. Histology of lymph node, spleen, tonsil & thymus.
    d. Normal chest radiograph showing heart shadows.
    e. Relationship to vascular access in dialysis
4. Gastro-intestinal system
    a. Demonstration of parts of gastrointestinal system.
    b. Normal radiographs of gastrointestinal system.
    c. Histology of gastrointestinal system.
5. Respiratory system
    a. Demonstration of parts of respiratory system.
    b. Normal radiographs of chest.
    c. Histology of lung and trachea.
6. Peritoneum
    a. Demonstration of reflections.
7. Urinary system
    a. Demonstration of parts of urinary system.
    b. Histology of kidney, ureter, urinary bladder.
    c. Radiographs of abdomen-IVP, retrograde cystogram.
8. Reproductive system
    a. Demonstration of section of male and female pelvis with organs in situ.
    b. Histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tube, ovary.
9. Endocrine glands
    a. Demonstration of the glands.
    b. Histology of pituitary, thyroid, parathyroid, suprarenal glands.
10. Nervous system
    a. Histology of peripheral nerve & optic nerve.
    b. Demonstration of all plexuses and nerves in the body.
    c. Demonstration of all parts of brain.
    d. Histology of cerebrum, cerebellum, spinal cord.
11. Sensory organs
    a. Histology of thin and thick skin.
    b. Demonstration and histology of eyeball.
    c. Histology of cornea & retina.
12. Embryology.
    a. Demonstration of models.

Physiology Practical's (60 Hours)

1. Hemoglobinometry.
2. White blood cell count.
3. Red blood cell count.
4. Determination of blood groups.
5. Leishman"s staining and differential WBC count.
6. Determination of packed cell Volume.
7. Erythrocyte sedimentation rate (ESR).
8. Calculation of blood indices.
9. Determination of clotting time, bleeding time.
10. Blood pressure recording.
11. Auscultation for heart sounds.
12. Artificial respiration.
13. Determination of vital capacity.

Biochemistry Practical's (60 Hours)

1. Analysis of normal urine.
2. Composition of urine.
3. Procedure for routine screening.
4. Urinary screening for inborn errors of metabolism.
5. Common renal disease.
6. Urinary calculus.
7. Urine examination for detection of abnormal constituents.
8. Interpretation and diagnosis through charts.
9. Liver function tests.
10. Lipid profile.
11. Renal function test.
12. Cardiac markers.
13. Blood gas and electrolytes.
14. Estimation of blood sugar, blood urea, serum creatinine and electrolytes.
15. Demonstration of strips, demonstration of glucometer.
16. Titration of a simple acid and a base (preparation of standard solution of oxalic acid and using this solution finding out the normality of a sodium hydroxide solution. Acid to be titrated using this base Calculation of normality of an acid or a base after titration, measurement of hydrogen ion concentration.

Community orientation and clinical visit (CT) (90 Hours)

The objective of this particular section of the foundation course is to sensitize potential learners with essential knowledge; this will lay a sound foundation for their learning across the under-graduate program and across their career. Innovative teaching methods should be used to ensure the attention of a student and make them more receptive such as group activities, interactive fora, role plays, and clinical bed-side demonstrations.

1. The community orientation and clinical visit will include a visit to the entire chain of healthcare delivery systems -Sub center, PHC, CHC, SDH, DH and Medical college, private hospitals, dispensaries and clinics.

2. The student will also be briefed regarding governance at village level including interaction and group discussion with village panchayat and front-line health workers.
3. Clinical/ OPD visit to their respective professional departments within the hospital.

Second Semester

Pathology (60 Hours)

1. Introduction to pathology & basic terminologies
   Terminologies
   1. Introduction to pathology
   2. Recognize the relevance of Pathology
   3. Define the basic terminologies and branches of Pathology
      a. Aaetiology
      b. Pathogenesis
      c. Pathological and clinical manifestations
      d. Complications & sequelae
      e. Prognosis
      f. Syndrome
      g. Lesion
   4. Explain the scope of the following branches of pathology:
      a. Histopathology
      b. Cytopathology
      c. Hematology
2. Cell injury & adaptation
   Cell adaptation
   Define cell growth, differentiation and cell. adaptation
   Describe the various cell adaptations with examples.
      a. Hypertrophy
      b. Hyperplasia
      c. Atrophy
      d. Metaplasia
      e. Dysplasia
   Necrosis
   1. Define necrosis
   2. Describe the various types of necrosis with clinical examples
      a. Coagulative necrosis
      b. Colliquative necrosis/ Liquefactive necrosis
      c. Caseous necrosis
      d. Fibrinoid necrosis
      e. Fat necrosis
      f. Gangrene

3. Inflammation
   Define inflammation. List the types with examples.

Acute inflammation

1. Define acute inflammation.
2. Describe the causes and cardinal signs of acute inflammation
3. Explain the vascular of acute inflammation.
4. Describe the cellular events in acute inflammation.
5. Explain the sequelae of acute inflammation.
6. Explain the beneficial, harmful and systemic effects of acute inflammation.

Chronic inflammation

1. Define chronic inflammation.
2. List the causes of chronic inflammation.
3. Describe the macroscopic and microscopic features in chronic inflammation.
4. List the cells in chronic inflammation.
5. Define granulomatous inflammation.
6. List the components of a granuloma and describe its morphology
7. List the causes of granulomatous inflammation.

4. Healing & repair

Wound healing

1. Define granulation tissue and describe the formation of granulation tissue.
2. Describe the following:
    a. Healing by first intention.
    b. Healing by second intention.
    c. Wound organization, contraction and scarring.
3. Explain the factors which modify (influence) healing and repair.

5. Fluid Hemodynamics

Oedema

1. Define oedema.
2. List the types of oedema.
3. Describe the pathogenesis and clinical features of the different types of oedema.

Shock

1. Define shock.
2. List the various types of shock.
3. Describe the pathogenesis of septic and hypovolemic shock.

Thrombosis (Arterial & Venous)

1. Define thrombosis.
2. Describe the factors influencing pathogenesis of thrombosis.
3. List causes of arterial and venous thrombosis.
4. List the fates of thrombus.

Embolism

1. Define embolism. List the types of embolism with examples.
2. Describe the clinicopathologic consequences of pulmonary thromboembolism

Infarction

1. Define infarction.
2. Describe the types and clinical significance of infarction.

6. Neoplasia
    1. Define neoplasia
    2. Describe the nomenclature of tumors with examples
    3. Define dysplasia and anaplasia
    4. Describe the differences between benign and malignant tumors
    5. Define carcinogenesis. List the types of carcinogens with example of each
    6. Describe the aetiology & predisposing factors of tumors
    7. Define metastasis.
    8. Describe the routes of metastasis with examples
    9. Describe the prognostic factors of tumors with emphasis on staging & grading
    10. Describe the various modalities for diagnosis of cancer
7. Infectious diseases

    Tuberculosis
    1. Describe the aetiology and mode of transmission of tuberculosis
    2. Describe the clinical features of tuberculosis.
    3. Describe the morphology of primary, secondary and miliary tuberculosis.

    Leprosy
    1. List the aetiological factors of leprosy
    2. Classify leprosy
    3. Describe the morphology of lepromatous and tuberculoid leprosy
8. Genetics
    1. Describe the basic concepts of genetics
    2. Define with suitable examples
        a. Autosomal dominant
        b. Autosomal recessive
        c. X-linked recessive
        d. Chromosomal abnormalities
    3. Define karyotyping
9. Blood vessels & heart

    Hypertension
    1. Define hypertension
    2. Classify hypertension
    3. Describe the effects of hypertension on various organs

    Atherosclerosis
    1. Define atherosclerosis
    2. List the sites of involvement by atherosclerosis
    3. Describe the predisposing factors, complications & clinical effects of atherosclerosis

    Ischemic heart disease/coronary artery disease
    1. Define ischemic heart diseases
    2. Describe the clinical spectrum of the disease (with reference to angina and myocardial infarction

    Aneurysm
    1. Define aneurysm
    2. List the causes, types and complications of aneurysms

Rheumatic heart disease
1. Define rheumatic heart diseases
2. Describe its aetiology & clinical features

Cardiac failure
1. Define cardiac failure
2. List the causes of cardiac failure
3. Describe its pathophysiology & clinical features

10. Respiratory system

Pneumonia
1. Define pneumonia
2. List the types of pneumonia
3. Describe the aetiology and clinical features of pneumonia

Chronic obstructive airway disease
1. Define chronic obstructive airway disease.
2. List the types of chronic obstructive airway Disease.

Emphysema
1. Define emphysema
2. List the types of emphysema
3. Describe the aetiology and clinical features of emphysema

Chronic bronchitis
1. Define chronic bronchitis
2. Describe the aetiology and clinical features of chronic bronchitis

Bronchiectasis
1. Define bronchiectasis
2. List the types of bronchiectasis.
3. Describe the aetiology and clinical features of bronchiectasis

Asthma
1. Define asthma
2. List the types of asthma
3. Describe the aetiology and clinical features of asthma

Pneumoconiosis
1. Define pneumoconiosis
2. List the types of pneumoconiosis
3. Describe the aetiology and clinical features of pneumoconiosis

11. Gastrointestinal tract & liver

Gastric & duodenal ulcers
1. Definition gastric and duodenal ulcer
2. Describe the aetiology, gross pathology and clinical features of gastric and duodenal ulcer

GIT malignancies
1. List the types of common GIT malignancies
2. Describe their predisposing factors & clinical features

Jaundice
1. Define jaundice
2. List the types of jaundice with examples

Viral hepatitis

1. Describe the aetiology of viral hepatitis
2. List the modes of infection
3. Describe the clinical features of viral hepatitis

Cirrhosis of liver

1. Define cirrhosis
2. List the causes of cirrhosis

Liver failure

1. Define liver failure
2. List the causes of liver failure
3. Describe its pathophysiology & clinical features

12. Renal system

Define nephrotic syndrome & nephritic syndrome with suitable examples

Renal failure

1. Define renal failure
2. List its types & describe the clinical features

13. Endocrine system

1. Define hyperthyroidism & hypothyroidism
2. Describe the causes, clinical features and laboratory diagnosis of hyperthyroidism and hypothyroidism
3. Describe the types, causes & clinical features of goiter
4. Describe types, clinical features, complications & laboratory diagnosis of diabetes

14. Nervous system

1. Define Cerebrovascular diseases
2. Describe its causes and clinical features

15. Musculoskeletal system

Fracture

1. Define fracture
2. List the types of fracture
3. Describe the process of fracture healing
4. List the factors influencing fracture repair

Osteomyelitis

1. Define osteomyelitis
2. Describe the aetiology, types and clinical features of osteomyelitis
3. Define and list the clinical features of Rheumatoid arthritis

16. Histopathology

    1. Introduction to histopathology.
    2. Receiving of specimen in the laboratory.
    3. Grossing techniques.
    4. Mounting techniques: various mountants.
    5. Maintenance of records and filing of the slides.
    6. Use & care of microscope.
    7. Various fixatives, mode of action, preparation and indication.
    8. Section cutting.
    9. Tissue processing for routine paraffin sections.

10. Decalcification of tissues.
11. Staining of tissues: H & E Staining.
12. Bio-medical waste management.

17. Clinical Pathology

    1. Introduction to clinical pathology.
    2. Collection, transport, preservation, and processing of various clinical specimens.
    3. Urine Examination: collection and preservation of urine, physical, chemical, microscopic examination.
    4. Examination of body fluids.
    5. Examination of cerebro spinal fluid (CSF).
    6. Sputum examination.
    7. Examination of faeces.

18. Hematology

    1. Introduction to hematology.
    2. Normal constituents of blood, their structure and function.
    3. Collection of blood samples.
    4. Anticoagulants used in hematology.
    5. Instruments and glassware used in hematology, preparation and use of glassware.
    6. Laboratory safety guidelines.
    7. SI units and conventional units in hospital laboratory.
    8. Hb, PCV.
    9. ESR.
    10. Normal hemostasis.
    11. Bleeding time, clotting time, prothrombin time, activated partial thromboplastin time.

19. Blood Bank
    1. Introduction.
    2. Blood grouping and Rh types.
    3. Cross matching.

Microbiology (60 Hours)

1. Introduction To Medical Microbiology, Virology, Mycology & Parasitology
2. Morphology
    a. Classification of microorganisms, size, shape and structure of bacteria. Use of microscope in the study of bacteria.
3. Growth and nutrition
    a. Nutrition, growth and multiplications of bacteria, use of culture media in diagnostic bacteriology.
4. Culture media
    a. Use of culture media in diagnostic bacteriology, antimicrobial sensitivity test.

2. Sterilization and Disinfection
    a. Principles and use of equipment of sterilization namely hot air oven, autoclave and serum inspissator, pasteurization, antiseptic and disinfectants.
5. Immunology
    a. Immunity, vaccines, types of vaccine and immunization schedule, principles and interpretation of common serological tests namely Widal, VDRL, ASLO, CRP, RF & ELISA.
    b. Rapid tests for HIV and HBsAg (excluding technical details).
6. Systematic Bacteriology
    a. Morphology, cultivation, diseases caused, laboratory diagnosis including specimen collection of the following bacteria (excluding classification, antigenic structure and pathogenicity), Staphylococci, Streptococci, Pneumococci, Gonococci, Meningococci, C. diphtheriae, Mycobacteria, Clostridia, Bacillus, Shigella, Salmonella, *E. coli*, Klebsiella, Proteus, Vibrio cholerae, Pseudomonas & Spirochetes.
7. Parasitology
    a. Morphology, life cycle, laboratory diagnosis of following parasites: *E. histolytica*, Plasmodium, tape worms, Intestinal nematodes.
8. Mycology
    a. Morphology, diseases caused and lab diagnosis of following fungi. Candida, Cryptococcus, Dermatophytes, opportunistic fungi
10. Virology
    a. General properties of viruses, diseases caused lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Rabies and Poliomyelitis.
11. Hospital infection
    a. Causative agents, transmission methods, investigation, prevention and control of hospital infection.
12. Principles and practice Biomedical waste management

General Pharmacology (60 Hours)

1. General Pharmacology
    a. Introduction
    b. Routes of drug administration
    c. Pharmacokinetics
    d. Pharmacodynamics
    e. Drug toxicity and safety
2. Autonomic nervous system including skeletal muscle relaxants.
    a. Cholinergic drugs
    b. Anticholinergic drugs:
    c. Neuromuscular blocking drugs
    d. Adrenergic drugs
    e. Adrenergic receptor antagonists

3. Central nervous system
    a. General anesthetics (GAs)
    b. Local anesthetics (LAs)
    c. Sedative & hypnotics
    d. Opioids
    e. NSAIDs
    f. Drug treatment of rheumatoid arthritis (RA)
    g. Drug treatment of gout:
    h. Psychopharmacology
    i. Parkinsonism
    j. Alcohol
    k. Antiepileptic drugs
4. GIT
    a. Drugs for peptic ulcer
    b. Antiemetics
    c. Laxatives and antidiarrheals
5. Blood
    a. Hematinic
    b. Anticoagulants
    c. Antiplatelet drugs
    d. Fibrinolytics and antifibrinolytics
6. Cardiovascular system
    a. Diuretics
    b. Drugs used in congestive heart failure (CHF)
    c. Antihypertensives
    d. Antianginal drugs
    e. Hypolipidemic
7. Respiratory System
    a. Pharmacotherapy of bronchial asthma
    b. Pharmacotherapy of cough
    c. Antihistaminic
8. Chemotherapy
    a. General aspects
    b. Beta lactam antibiotics
    c. Cotrimoxazole
    d. Macrolides
    e. Fluoroquinolones
    f. Antifungal agents
    g. Antiviral drugs
    h. Antitubercular drugs
    i. Antileprotic drugs
    j. Aminoglycosides
    k. Antiamoebic drugs
    l. Anthelmintics
    m. Antimalarial drugs

9. Hormones and related drugs
    a. Glucocorticoids
    b. Antidiabetic drugs
    c. Thyroid and anti-thyroid drugs
10. Immunosuppressors and Immunomodulators

Applied anatomy & physiology related to Dialysis Therapy (60 Hours)

Applied anatomy.

1. Basic anatomy of urinary system: structural anatomy of kidney, bladder, ureter, urethra, prostate.
2. Histology of kidney.
3. Blood supply of kidney.
4. Development of kidney in brief.
5. Anatomy of peritoneum including concept of abdominal hernias.
6. Anatomy of vascular system:
    a. Upper limb vessels: course, distribution, branches, origin & abnormalities.
    b. Neck vessels: course, distribution, branches, origin & abnormalities.
    c. Femoral vessels: course, distribution, branches, origin & abnormalities.
    d. Artery & Veins used for dialysis.
7. Histology of bladder, urethra
8. Innervation of urinary bladder

Physiology

1. Mechanism of urine formation.
2. Glomerular filtration rate (GFR).
3. Clearance studies.
4. Physiological values of urea, creatinine, electrolytes, calcium, phosphorous, uric acid, magnesium, glucose; 24 hours urinary indices – urea, creatinine, electrolytes, calcium, magnesium.
5. Physiology of renal circulation
    a. Factors contributing & modifying renal circulation.
    b. Auto regulation.
6. Hormones produced by kidney & physiologic alterations in pregnancy.
7. Haemostasias: coagulation cascade, coagulation factors, auto regulation, BT, CT, PT, PTT, thrombin time.
8. Acid base balance: basic principles & common abnormalities like hypokalemia, hyponatremia, hyperkalemia, hypernatremia, hypocalcemia, hypercalcemia, pH, etc.
9. Basic nutrition in renal diseases.
10. Basics of ECG, ECHO
11. Juxta Glomerular Apparatus
12. Micturition reflux

Fundamentals of Dialysis Therapy (45 Hours)

1. Indications of dialysis.
2. Types of dialysis.
   List the types of Hemodialysis
   List the types of Peritoneal dialysis
3. Principles of Hemodialysis
   Define Hemodialysis Principles
   Discuss the application of diffusion in HD and list the factors affecting diffusion
   Discuss ultrafiltration and convection in hemodialysis and factors affecting them
   List the factors affecting solute clearance in HD
   Define Kuf & KoA
4. Principles of Peritoneal Dialysis
   Define Peritoneal Dialysis Principles
   Discuss the application of diffusion in PD and list the factors affecting diffusion
   Discuss ultrafiltration/ Osmosis, convection and fluid absorption in Peritoneal Dialysis and factors affecting them
   List the factors affecting solute clearance in PD
5. Hemodialysis Apparatus
   Vascular Access
   Water Treatment Plant
   Extracorporeal Blood Circuit
   HD machine
   Dialysate
6. Basics of Semipermeable membrane & Peritoneal Membrane
   Define semipermeable membrane
   List the properties of a semipermeable membrane
   List the importance of biological semipermeable membrane
   List the importance of semipermeable membrane in the field of dialysis – HD & PD
   Define biocompatibility and explain its importance in the dialysis field
   Discuss the factors affecting the permeability of the semipermeable membrane in HD & PD
7. Peritoneal Dialysis Apparatus.
   PD Access
   PD fluid
   PD Cyclers
8. Introduction to hemodialysis machine.
   Electronics Circuit
   Hydraulics Circuit
   Alarms in HD machine
9. Priming of dialysis apparatus.
   Purpose
   Assembling
   Steps for priming HD apparatus.

10. Dialyzer reuse.
    Chemicals Used
    Purpose
    Advantages and Disadvantages
    Steps involved in reuse
11. Common complications of hemodialysis.
12. Monitoring patients during dialysis.

Pathology Practical's (30 Hours)

1. Urine Examination: physical, chemical, microscopic.
2. Blood grouping Rh typing.
3. Hb estimation, packed cell volume (PCV), erythrocyte sedimentation rate (ESR).
4. Bleeding time, clotting time.
5. Histopathology: section cutting and H &E staining.
   Renal Biopsy Slides

Microbiology Practical's (30 Hours)

1. Compound microscope.
2. Demonstration of sterilization equipment"s: hot air oven, autoclave, bacterial filters.
3. Demonstration of commonly used culture media, nutrient broth, nutrient agar, blood agar, chocolate agar, MacConkey medium, L J media, Robertson cooked meat media, Potassium tellurite media with growth, MacConkey medium with LF & NLF, NA with staph.
4. Anaerobic culture methods.
5. Antibiotic susceptibility test.
6. Demonstration of common serological tests: Widal, VDRL, ELISA.
7. Gram staining.
8. Acid fast staining.
9. Fungal Staining
10. Stool exam for helminthic ova & cysts.
11. Visit to hospital for demonstration of work done by infection control team and biomedical waste management department.

Applied Anatomy & Physiology related to dialysis therapy practical's (30 Hours)

Applied Anatomy

1. Urinary system
    e. Demonstration of parts of urinary system.
    f. Histology of kidney, ureter, urinary bladder.
    g. Radiographs of abdomen-IVP, retrograde cystogram.

b. Development of Kidney
c. Peritoneum
    a. Demonstration of reflections.

d. Anatomy of vascular system:
    a. Upper limb vessels.
    b. Neck vessels
    c. Femoral vessels
    d. Artery & Veins used for dialysis.

Applied Physiology

1. Estimation of GFR
2. Hemoglobinometry.
3. Determination of clotting time, bleeding time.
4. Blood pressure recording.
5. Auscultation for heart sounds.
6. Interpretation of ECG & ECHO

Fundamentals of Dialysis Therapy Practical (30 Hours)

1. HD Apparatus Spotters
   Vascular Access
   Water Treatment Plant
   Extracorporeal Blood Circuit
   HD machine
   Dialysate
2. Priming of Dialysis Apparatus
   Assembling
   Steps for priming HD apparatus
3. Dialyzer reuse
   Steps involved in reuse
4. Monitoring during dialysis
   Patient Monitoring
   Vitals
5. Managing complications during dialysis.
6. Understanding Dialysis Blood Circuit.

Clinical Postings- I (135 Hours)

Students will gain additional skills in clinical procedures, interaction with patients and professional personnel. Students apply knowledge from previous clinical learning experience under the supervision of a senior dialysis therapist. Students are tested on intermediate clinical dialysis therapy skills.
Areas to be covered.

1. OPD
2. Dialysis Unit
3. Procedure room for assisting in Renal Biopsy.

Third Semester

Sociology in Health Care (45 Hours)

1. Introduction to medical sociology
    a. Definition, objectives, principles, scope, and its relevance to patient care.
    b. Difference between sociology of medicine and sociology in medicine.
    c. Historical development of medical sociology.
    d. Sociological perspectives of health and illness.
2. Social Patterning of health
    a. Social Class
    b. Gender
    c. Ethnicity
    d. Age
    e. Place
    f. Health and development
    g. Marital and Cultural Factors
    h. Psycho-Social Factors
    i. Social
    j. Life Events
    k. Life Course
3. Social epidemiology
    a. Definitions, socio-cultural factors bearing on health in India.
    b. Common occupational diseases and prevention of occupational diseases.
4. Health profession and organization
    a. Medical social service in a hospital
    b. Hospital as a social organization.
    c. Professional qualities of a physician.
5. Principles of sociology
    a. Definition, objectives
    b. Nature and scope of sociology
    c. Origin and Nature of society.
    d. Social groups – characteristics and functions
    e. Social control
    f. Culture and civilization
6. Sociology of health and hospital management
    a. Health, development, and care
    b. Third world countries health
    c. Challenges of health and health care administration.

Biomedical Waste Management (30 Hours)

Bio medical waste management and environment safety- The aim of this section will be to help prevent harm to workers, property, the environment, and the general public. Topics to be covered under the subject are as follows:

1. Definition of Biomedical Waste
2. Waste minimization
3. BMW – Segregation, collection, transportation, treatment, and disposal (including color coding)
4. Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste
5. BMW Management & methods of disinfection
6. Modern technology for handling BMW
7. Use of Personal protective equipment (PPE)
8. Monitoring & controlling of cross infection (Protective devices)
9. Acts/Law of BMW
10. HAZMAT

Pathophysiology of Kidney Diseases (75 Hours)

1. Acute Kidney Injury.
2. Glomerular pathology Primary and Secondary
3. Renal biopsy
4. Nephrotic syndrome – primary & secondary.
5. Nephritic syndrome.
6. UTI (urinary tract infections.)
7. Asymptomatic urinary abnormalities.
8. Chronic Kidney Diseases.
9. Renal stone diseases.
10. Obstructive uropathies.
11. Congenital abnormalities of urinary system
12. Inherited renal diseases.
13. Tumors of kidney & Urinary Bladder.
14. Pregnancy associated renal diseases.
15. Renal vascular disorders & hypertension associated renal diseases.
16. Tubulo-interstitial diseases.
17. Renal vascular disorders.
18. Pathology of kidney in hypertension, diabetes mellitus.
19. Pathology of peritoneum, peritonitis, bacterial, tubular & sclerosing peritonitis, dialysis induced changes.
20. Renal Tuberculosis
21. Hepatotropic viruses in detail: mode of transfusion, universal precautions vaccinations.
22. Human immunodeficiency virus (HIV), mode of transfusion, universal precautions & HIVAN.
23. Opportunistic infections.

24. Microbiology of vascular access infection (femoral, jugular, subclavian catheters).
25. Sampling methodologies for culture & sensitivity.
26. Reflux Nephropathy
27. Basic tropical disease

Instrumentation Specific to Dialysis Therapy (75 Hours)

1. Equipment‟s used in Hemodialysis.
    a. HD machine -Components and function
    b. HD machine – Blood Circuit
    c. HD machine – Dialysate circuit
    d. Cleaning and disinfection of HD machine
    e. OCM
    f. Trouble shooting equipment related problems during HD.
2. Water treatment System
    a. Purpose of water treatment
    b. AAMI and ISO standards for RO water.
    c. Filtration
    d. Softener and carbon filtration
    e. Deionizer
    f. RO system
    g. Ultrafiltration and UV Irradiation
    h. Portable RO
    i. Heat disinfection of water lines
3. Dialyzer Reprocessing Equipment
    a. Types of Automated dialyzer reprocessing machine
    b. Automated reuse equipment – components and function
    c. Automated reuse equipment – care and maintenance
4. Equipment‟s used for special procedures.
    a. Types of CRRT equipment
    b. CRRT equipment – components and function
    c. CRRT equipment – care and maintenance
5. PD cyclers
6. Defibrillators
7. Cardiac Monitors
8. MARS, SPAD and Prometheus System for Liver dialysis
9. ECMO
10. Plasmapheresis Equipment‟s
11. Bioimpedance analysis machine/ Body Composition Monitors
12. Online Hemodiafiltration
13. Blood Temperature, Blood Volume monitor
14. Enuresis monitor
15. Ultrasound machine- For Depth, Flow of AVF

Basic Principles of Nursing Care (45 Hours)

1. Bed making
2. Vital Signs Monitoring
3. Input and Output chart
4. Maintenance of emergency crash cart
5. Bladder catheterization
6. Injections – intravenous, intramuscular, subcutaneous
7. Insertion of intravenous canulae
8. Cleaning and dressing of wounds and vascular access sites and peritoneal catheter exit site
9. Assisting the physician in procedures like minor surgery, vascular access, etc
10. Suturing & Removal of sutures
11. Care of bed ridden patients,
12. Documentation
13. Collection of blood, urine and stool specimens and their transfer aseptic precautions to the laboratory

Medical Law and Ethics (30 Hours)

Legal and ethical considerations are firmly believed to be an integral part of medical practice in planning patient care. Advances in medical sciences, growing sophistication of the modern society‟s legal framework, increasing awareness of human rights and changing moral principles of the community at large, now result in frequent occurrences of healthcare professionals being caught in dilemmas over aspects arising from daily practice.

Medical ethics has developed into a well based discipline which acts as a "bridge" between theoretical bioethics and the bedside. The goal is "to improve the quality of patient care by identifying, analyzing, and attempting to resolve the ethical problems that arise in practice" Doctors are bound by, not just moral obligations, but also by laws and official regulations that form the legal framework to regulate medical practice. Hence, it is now a universal consensus that legal and ethical considerations are inherent and inseparable parts of good medical practice across the whole spectrum. Few of the important and relevant topics that need to focus on are as follows:

1. Medical ethics - Definition - Goal - Scope
2. Introduction to Code of conduct
3. Basic principles of medical ethics – Confidentiality
4. Malpractice and negligence - Rational and irrational drug therapy
5. Autonomy and informed consent - Right of patients
6. Care of the terminally ill- Euthanasia
7. Organ transplantation
8. Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.
9. Professional Indemnity insurance policy

10. Development of standardized protocol to avoid near miss or sentinel events.
11. Obtaining an informed consent.

Instrumentation Specific to dialysis therapy Practical's (60 Hours)

1. Equipment"s used in Hemodialysis Parts
    a. HD machine
    b. Blood Circuit
    c. Cleaning and disinfection of HD machine
    d. OCM
    e. Trouble shooting of HD.
2. Water treatment System Parts
    a. Sand Filters
    b. Softener and carbon filtration
    c. Deionizer
    d. RO system
    e. Ultrafiltration and UV Irradiation
    f. Portable RO
    g. Heat disinfection of water lines
3. Dialyzer Reprocessing Equipment parts
4. Automated reuse equipment – care and maintenance
5. Equipment"s used for special procedures.
    a. Types of CRRT equipment parts
6. PD cyclers parts and usage
7. Defibrillators parts and usage
8. Cardiac Monitors
9. MARS, SAPD and Prometheus System Parts
10. ECMO Machine parts
11. Plasmapheresis centrifugal machine parts
12. Bioimpedance analysis machine/ Body Composition Monitors parts and working mechanism.
13. Online Hemodiafiltration machine parts
14. Blood Temperature, Blood Volume monitor
15. Enuresis monitor
16. Ultrasound machine- For Depth, Flow of AVF

Clinical Postings II (CT) (180 Hours)

Students will gain additional skills in clinical procedures, interaction with patients and professional personnel. Students apply knowledge from previous clinical learning experience under the supervision of a senior dialysis therapist. Students are tested on intermediate clinical dialysis therapy skills.

Areas to be covered.

1. OPD
2. Dialysis Unit
3. Procedure room for assisting in renal biopsy & central venous catheterization/ PD catheterization.

Fourth Semester

Pharmacology related to dialysis therapy. (60 Hours)

1. IV fluid therapy with special emphasis in renal diseases
    a. Basics of fluid therapy
    b. Calculation of fluid infusion
    c. Intra-venous fluid administration
    d. Commonly used iv fluids
2. Diuretics
    a. Diuretics and its classification, actions, dosage, side effects & contraindications
3. Anti-hypertensives
    a. Classification of anti-hypertensive drugs, its actions, dosage, side effects & contraindications, special reference during dialysis, vasopressors, drugs used in hypotension.
4. Drugs and dialysis
    a. Importance of dialyzabilty of drugs
    b. Factors affecting the dialyzability of drugs.
    c. Drugs that need modifications
    d. Physicochemical characteristics of the drug and dialyzability
    e. Dialysis properties that affect drug clearance.
    f. Dialyzability of phenobarbital
    g. Dialyzability of lithium
    h. Dialyzability of methanol
5. Vitamin-D & its analogues, phosphate binders, iron, folic acid & other vitamins of therapeutic value
    a. Metabolism of Vitamin D in health & disease.
    b. Mechanism of action, Therapeutic use and contraindication of
        i. Vitamin D & its analogues.
        ii. phosphate binders & Newer Phosphate Binders.
        iii. Calcimimetics Agents
        iv. vitamin B12and folic acid.

6. Erythropoiesis Stimulating Agent (ESA)
    a. Use of ESAs
    b. Different types of ESAs
    c. Mechanism of action of ESAs
    d. Pharmacokinetics of ESAs
    e. Therapeutic use of ESAs
    f. Adverse effect of ESAs.
       Precautions and contraindications of ESAs.
7. Heparin and low molecular weight heparin (LMWH)
    a. Mechanism of action of unfractionated heparin (UFH).
    b. Mechanism of action of LMWH.
    c. Contraindication of unfractionated heparin and LMWH.
    d. Adverse effect of heparin and LMWH.
    e. Monitoring of heparin therapy.
    f. Heparin induced thrombocytopenia.
8. Protamine sulphate
    a. Therapeutic use of Protamine Sulphate.
    b. Dosage and administration
    c. Adverse reaction.
9. Newer anticoagulants
    a. Pharmacology of heparinoids.
    b. Pharmacology of regional citrate anticoagulant
    c. Pharmacology of thrombin inhibitors
10. Chemicals Used in Dialysis Unit (Renalin- Peroxyacetic Acid, Formalin, Citrate, Sodium hypochlorite and hydrogen peroxide)
    a. Therapeutic use, precautions, and adverse effects of formalin
    b. Therapeutic use, precautions, and adverse effects of citrate
    c. Therapeutic use, precautions, and adverse effects of sodium hypochlorite
    d. Therapeutic use, precautions, and adverse effects of hydrogen peroxide
    e. Therapeutic use, precautions, and adverse effects of Peroxyacetic Acid
11. Hemodialysis concentrates
    a. Composition of hemodialysis concentrates.
    b. Types of hemodialysis concentrates and write it‟s advantages and disadvantages
    c. Clinical implication of altered dialysate composition
12. Peritoneal dialysis (PD) fluid
    a. Buffer and pH of PD fluid.
    b. Electrolyte concentrations of PD fluid
    c. Newer PD Solutions
13. Potassium exchange resin
    a. Clinical pharmacology, mechanism of action and therapeutic use of potassium exchange resin.
    b. Contraindications of potassium exchange resin
    c. Adverse reactions of potassium exchange resins
    d. Drug interactions of potassium exchange resin

14. Immuno Suppressive Drugs
15. CRRT Replacement & Dialysis Solutions
16. Online HDF
17. Emergency Drugs used in Dialysis
18. IV iron preparations.
19. Organ Preservation Solutions
20. Other Newer Drugs for Dialysis & Transplantation.

Psychology (45 Hours)

1. Introduction to Psychology
    a. Definition of Psychology, Branches, Fields and Scope of Psychology, Educational and School Psychology‟ Physiological, Developmental, Social, Industrial and Organizational and Clinical Psychology. Emerging specialties, Environmental, Forensic and Health Psychology.
2. Scientific methods of studying Psychology
    a. Experimental, Observational, Case Study/Clinical Methods, Interview, Survey, Introspective and Testing Methods – Merits and Demerits.
3. Major schools of Psychology
    a. Structuralism-Functionalism-Behaviorism-Gestalt Psychology-Humanistic Psychology
4. Physiological basis of Psychology
    a. The Nervous System: Division of the nervous system, Neurons, Transmission of neural signals. The Synapse; The Implication of Chemical Transmission, Reflex Arcs and The Spinal Cord, The Endocrine System, The Brain, The Cerebral Hemispheres, The Central Core, Disorders of the Brain, Studying Brain behavior relations
5. Normal development
    a. Definition, Psychological needs and Development during Infancy, Early Childhood, Late Childhood, Adolescence, Adulthood and Old Age. Brief description of the relative importance of heredity and environment
6. Attention and Perception
    a. Definition, Types of attention, Voluntary, Involuntary and Habitual. Determinants of attention. Principles of perception, Inaccurate perception and Underlying reasons. Brain mechanisms of visual perception, Effects of brain damage on visual perception, Perception of form, Perception of Space and Motion.
7. Personality
    a. Definition- Trait and Type Theories of Personality, The social learning approaches: Bandura, Psychodynamic approach: Freud, The humanistic approach: Maslow and Self- actualization. Rogers and Conditions of worth, Assessment of Personality through questionnaires and Projective tests.

8. Learning and Memory
    a. Definition, Factors affecting learning, Laws of learning by Thorndike; Importance of studying Psychology of learning in relation to Allied Health Sciences. Experimentation in learning: Human and Animal learning, Quantitative assessment of learning; Learning curves; Theories of conditioning, Pavlov‟s contribution. The biological significance of classical conditioning-Basic principles of classical conditioning-Conditioned emotional responses, what is learned in classical conditioning?
    b. Operant conditioning; The laws of effect of Skinner and operant behavior, The three contingencies, Reinforcement, Punishment and Extraction, Other Operant procedures and Phenomena. Conditioning of complex behavior, Aversive control of behavior, Observation and imitation.
    c. Sensory memory, short term or Working memory, Long term memory learning and encoding in long term memory, Organization of long-term memory, Reasons for forgetting.
9. Intelligence
    a. Definition, meaning of intelligence, Theories of intelligence, Spearman‟s two factor theory, an information processing theory of intelligence, The neuro psychological theory of intelligence, Mental age, and I.Q, Normal distribution of intelligence levels, Intelligence Testing, Intelligence tests, Uses and abuses of intelligence tests.
10. Motives and Emotions
    a. Definition, Motives, Drives, Needs, Biological needs, Eating, Sexual behavior, Aggressive behavior. The nature of Emotions, Expression and recognition of Emotions, Feelings and Emotions, Physiological basis of Emotions, Emotion and health, Heart disease, Headache, Asthma, Rheumatoid arthritis, Cancer and Peptic Ulcer. Theories of Emotions, James Lange theory, Cannon Bard theory and other theories
11. Attitudes and their Formation
    a. Sources of attitude, Nature of attitudes. Measurement of attitudes. Change of attitudes, Persuasion, Prejudices. Social influences and Group behavior, Imitation, social facilitation, social loafing, Reciprocity, Commitment, Attractive people, Authority, Group decision making, resisting social influence, Interpersonal relation and loving.
12. Lifestyle, Health, Stress and Coping Behavior
    a. Cultural evolution, Life style choices and consequences, Healthy and Unhealthy life styles. Nutrition, Physical fitness, Smoking and Drinking. Stress and Health, the biological basis of stress, Stress and Physical functioning, Coping with stress, Adjustment a life-long process. Cognitive appraisal and Stress, Stressful life styles, coping with everyday stress, Sources of stress, Coping styles and Strategies, Stress inoculation training
13. Communication
    a. Persuasion, Communication, the source, the message, the audience, Behavior in groups, the nature of groups, Leadership, Group structure, Group thinking, Herold Leavitt‟s communication network.

14. Clinical Psychology
    a. Definition of Clinical Psychology, Role of Clinical Psychology in Allied Health Sciences, Concept of Normality and Abnormality. The nature and causes of mental disorders. Classification of abnormal behavior DSMIV, ICD 10, Difference between Neuroses and Psychosis. Anxiety, Somatoform and Dissociative disorders, Personality disorders, Psychoactive substance use disorders, Schizophrenic disorders, Mood disorders
15. Psychological Assessment and Treatment
    a. Tests of intelligence (important test), Tests of personality (important test), Tests for adjustments and conflicts (Bells adjustment inventory, Sentence Completion Test, Projective tests such as Rorschach, TAT, CAT, CPT etc.) The treatment of mental disorders, Insight therapies, Psychoanalysis and Psychodynamic approaches, Humanistic therapy, Gestalt therapy, Behavior and Cognitive Behavior therapies, Counselling. Group therapy, Electro convulsive therapy, Psychosurgery, Ethical and legal issues in Psychotherapy.

RENAL NUTRITION (45 Hours)

1. Basics of Nutrition
2. Nutritional Screening and Assessment
    - Introduction
    - Mini Nutritional Assessment
    - Nutritional Assessment
        i. Medical History
        ii. The effect of comorbidities
        iii. Medications and Drug-Nutrient Interactions
        iv. Psychosocial History
        v. Dietary History
        vi. Physical Examination
        vii. Anthropometric Measurements
        viii. Biochemical Assessment and Laboratory Data
    - Nutritional Assessment Tools
        i. Subjective Global Assessment (SGA)
        ii. Dialysis Malnutrition Score (DMS)
        iii. Malnutrition and Inflammation Score (MIS)
3. Impact of kidney disease on amino acid, protein, carbohydrate and lipid metabolism
    - Metabolic alterations in kidney disease
    - Impact of kidney disease on acid base balance,
    - Impact of kidney disease on protein and amino acid metabolism,
    - Impact of kidney disease on carbohydrate metabolism and
    - Impact of kidney disease on lipid metabolism

4. Nutritional management in CKD patient (pre-dialysis) fluid and electrolytes
    - Determine of Nutritional care in CKD patient,
    - Nutritional care indications
    - Nutrient guidance for adult patient with pre-ESRD
    - Management of fluid in patient with pre-ESKD and electrolytes management in patient with pre-ESRD.
5. Nutritional management of HD patient
    - Purpose of nutritional management in HD patient
    - Factors favoring nutritional status
    - Nutrient guidance in HD patient
    - Intentions of nutrition care in HD patient
    - Diet in HD patient
6. Nutritional management of Peritoneal Dialysis (PD) patient
    - Nutrient guidance in PD patient
    - Intentions of nutrition care in PD patient
    - Diet in PD patient
7. Nutritional management of renal transplant recipient
    - Motives of medical nutrition therapy for renal transplant recipient,
    - Factors favoring nutritional status,
    - Nutrient favoring for kidney transplant recipient
    - Determine nutrition care for kidney transplant recipient and diet for kidney transplant recipient
8. Nutritional management of acute kidney injury (AKI)
    - Determination of medical nutrition therapy for patient with AKI
    - Factors favoring nutritional status,
    - Nutrient recommendation for patient with AKI
    - Determination of nutrition care in patient with AKI and nutritional support for patient with AKI
9. Calcium, phosphate, parathyroid hormone & vitamin-D in CKD patients
    - Chronic kidney disease and mineral bone disease (CKD MBD),
    - Influence of kidney disease on Ca,
    - Phosphate, PTH and Vitamin- and nutritional modification in CKD MBD.
10. Goals of nutritional management in HD patient,
11. factors influencing nutritional status in HD & PD
12. Purpose of nutrition care in HD & PD.

Dialysis Therapies – Part I (75 Hours)

1. Hemodialysis equipment
   Hemodialysis apparatus, function of dialysis machine, parts of extracorporeal circuit of dialysis machine, parts of dialysis delivery system
2. Initiation of dialysis therapy
   Initiating of dialysis therapy, choice of modality, options of renal replacement therapy, when to initiate dialysis, relationship between uremic syndrome and eGFR, indications of dialysis in the chronic setting and concept of early initiation of dialysis

3. Types of dialyzers and its membrane
   Structure of dialyzer, types of dialyzers, hollow fiber dialyzer, Parts of hollow fiber dialyzer, types of dialyzer membranes, cellulosic membrane, Synthetic membranes and its advantages, dialyzer performance and clearance, biocompatibility of the dialyzer, advantages of biocompatible membrane
4. Composition of dialysis solution
   Preparation of dialysate, types of concentrate, mixing of dialysate, chemical used to prepare dialysate, monitoring of dialysate parameter for quality maintenance, consequences of altered dialysate composition
5. Vascular access and its types and complication
   Types of vascular access for hemodialysis, permanent and temporary catheter, location of temporary catheter, pre-dialysis assessments for all types of vascular access, sign of exit site infection of catheter, importance of catheter care including hand hygiene and dressing, method of catheter lock, indication and contraindications of AVF, locations and construction of AVF, preparation of AVF evaluation, advantages, disadvantages and complications of AVF, AVG and its indications, characteristics of graft materials, types of synthetic materials, Types of AVG and its locations, Hero graft, advantages and disadvantages of AVG, use of Doppler for creating AVF & AVG, Use of USG for temporary access creation, Basic Uses of Doppler & USG.
6. Cannulation of vascular access in HD
   Importance of cannulation, steps in cannulation, skin preparation, Rule of 6"s, cannulation and its techniques- ladder rope, buttonhole and same area, needle removal and hemostasis, post dialysis assessment and cannulation of new fistula
7. Vascular access surveillance
   Arm Elevation Test, Allen"s Test, Inflow & Out flow stenosis & define vascular access recirculation, classify vascular access recirculation, causes, symptoms and indication of recirculation, Measurement of access recirculation, protocol for urea-based measurement recirculation, Alternative means of measuring access recirculation.
8. Types of hemodialysis modalities
   Categorize types of HD, Incenter hemodialysis and its advantages and its disadvantages, home hemodialysis – its indications, contraindications, Requirements, Ideal characteristics, Machines, types advantages and its disadvantages.
9. Dialyzer reprocessing
   Need for Dialyzer reprocessing, techniques, Steps in dialyzer reprocessing, advantages and disadvantages of dialyzer reprocessing, automated dialyzer reprocessor, advantages of dialyzer reprocessing machine, safe practice in reuse, factors affecting reusability of dialyzer, strategies to maximize reuse, preparation dialyzer for reuse, quality assurance and dialyzer reprocessing and water requirements.
10. Anti-coagulation
    principle coagulation pathways, blood clotting in the extracorporeal circuit, heparin, clotting tests used to monitor heparin therapy, routine heparin dosage prescription, heparin rebound phenomenon, regional heparinization, tight heparinization, heparin free dialysis- its indication, bicarbonate dialysis solution with low-concentration citrate and other anticoagulation techniques.

11. Hemodialysis adequacy
    Definition, explain urea kinetic modelling (UKM), urea as a marker for uremic toxins, urea reduction ratio (URR), advantages and disadvantages of URR, single pool kt/v, double pool UKM and eq kt/v.
12. Water treatment unit (WTU)
    Purpose of water treatment for dialysis, various sources of water, types of contaminants in water, various contaminants in water and its effect, components of a dialysis center‟s WTU, pre-treatment components, primary treatment components, distribution system, monitoring and testing of dialysis water treatment system, microbial testing and chemical monitoring
13. Medications used in dialysis patients.
    List the drugs used in dialysis patients, indication of these drugs- heparin, Volume expanders like saline, albumin, Sodium bicarbonate, Glucose, Xylocaine, Antibiotics, Inj. Erythropoietin, iron, Vitamins, Anticonvulsants, Deferoxamine, Phosphate binders, Anti-hypertensives and emergency drugs.
14. Infection control and universal precaution
    Prevention of infection in dialysis unit, infection control practices in dialysis unit, Universal precaution, current recommendation for immunization in patients with chronic kidney disease, methods that decrease the risk of infection in the vascular access, spread of hepatitis B, hepatitis C, hepatitis D and HIV in dialysis unit, specific infection control requirement for a patient with hepatitis B, why person with CKD are predisposed to development of active tuberculosis after exposure to the bacterium, dialyzer reprocessing contributing to bacteremia, reasons why patients with HIV do not require special isolation or infection control procedures.

Medical Electronics for health sciences (45 Hours)

1. Introduction to semiconductor devices
   Principles of semiconductor diodes, Zener diode, BJT, FET, SCR & UJT and applications of diodes
2. Amplifiers
   Basic amplifier configuration, types of amplifiers – Voltage amplifiers, current amplifiers, power amplifiers, frequency response, low noise pre amplifiers.
3. Feedback Amplifiers and Oscillators
   Principles of feedback amplifiers, condition for sustained oscillation, RC and LC oscillators
4. Introduction to ICs
   Linear and digital ICs, applications of op amp like amplifiers, waveform generators, timer, A/D and D/A converters, active filters
5. Transducers and display devices
   Various types of transducers – electric, capacitive, inductive, photo electric and piezoelectric. Types of recorders – ink jet, heated styles, photographic, low frequency magnetic tape recorder. Different types of oscilloscopes – long persistence, storage, digital scopes.

6. Introduction to diagnostic equipment
   Bio potential recording devices, ECG, EEG, EMG, non-electrical parameter measurements, biochemical and microbiologic equipment.
7. Introduction to imaging techniques
   Principles of radiography, ultrasonography, and radioisotopes

Research methodology and biostatistics (60 Hours)

1. Introduction to the Process of Conducting Research
   Introduction, Steps in the Process of Research, identifying a hypothesis and/or research problem, specifying a purpose, Research Designs, creating research questions, Review of literature, Ethics of research and informed consent, Research proposal writing & components of Research paper.
2. Introduction to Qualitative, Quantitative and Mixed methods Research
   Essence of Qualitative Data, Sampling, Collection Techniques, Biography, Essence of Quantitative Data, Collection and Analysis Techniques, Choosing a good instrument, Interval and Ratio Scales, Validity and Reliability, Essence of Mixed Methods, Advantages, Design Components, Explanatory Mixed Methods Frameworks
3. Epidemiological Methods
   Measuring disease frequency, Descriptive and analytical studies-observational and experimental studies and Biases in Epidemiological Studies
4. Introduction to Probability, distributions and sampling
   Probability, addition and multiplicative theorems, problems, Probability Distribution-Binomial, Poisson, Normal, Applications to health sciences, Sampling methods, uses of sampling, Sample size
5. Introduction to Descriptive Statistics
   Introduction, Summarizing and describing a collection of data, Univariate and bivariate analysis, Mean, mode and standard deviation, Percentages and Ratios, Histograms, identifying randomness and uncertainty in data, summarizing biological data, Identifying the dependent and independent variables, Confidence levels
6. Introduction to Inferential Statistics
   Drawing inference from data, Estimation, testing of hypothesis, Type I & type II errors, power and p-value, modelling assumptions, Identifying Patterns, Regression analysis, t-test, Analysis of Variance, Correlations, Chi-square, Non-parametric tests

PHARMACOLOGY RELATED TO DIALYSIS THERAPY Practical's (60 Hours)

1. Administration of Erythropoiesis stimulating agents (ESA)
2. IV Iron Preparation
3. Vitamin supplements
4. Crystalloids & Colloids
5. Inotropic drugs
6. Anti-pyretic drugs
7. Anti-emetic drugs
8. Heparin, LMWH and Tri-sodium citrate, Regional Anticoagulation
9. Chemicals used in dialysis unit
10. PD fluids

11. Dialysis & CRRT solutions
12. Emergency Drugs used in Dialysis

DIALYSIS THERAPY PART- 1 Practical (60 Hours)

HD Equipment

1. Motor brush
2. Loading valve
3. Shunt cover
4. Hansen connector
5. Blood pump motor
6. Diasafe or Cut-off filter
7. Degas filter

Calculating Hemodialysis Adequacy
Assessing HD Vascular Access
Cannulating HD Vascular Access
Water Treatment Plant Maintenance

1. Daily
2. Weekly

Infection Control in dialysis unit

Clinical Postings III (CT) (180 Hours)

Students will gain additional skills in clinical procedures, interaction with patients and professional personnel. Students apply knowledge from previous clinical learning experience under the supervision of a senior dialysis therapist. Students are tested on intermediate clinical dialysis therapy skills.
Students will continue with their clinical procedures along with careful analyzing and performing AVF and AVG cannulation and decannulation procedure, monitoring of water quality with the assistance of senior dialysis technologist.

Areas to be covered.

1. OPD
2. Dialysis Unit
3. Procedure room for assisting in biopsy & catheterization.

Fifth Semester

Dialysis Therapies – Part II (60 Hours)

1. Hemodialysis procedure
   a. Patient assessment, management and prevention– General, pre, intra and post dialysis
   b. Lab data analysis
   c. Machine monitoring during hemodialysis
2. Hemodialysis prescription
   a. Acute hemodialysis prescription
   b. Chronic hemodialysis prescription
3. Acute complication
   1. Classify intra-dialytic complications- frequent and less commonly occurring
   2. Sign, symptoms, prevention and management of
      a. Hypotension,
      b. Muscle cramps,
      c. Nausea and vomiting,
      d. Chest pain and back pain,
      e. Fever and chills,
      f. Itching,
      g. Headache,
      h. Dialysis disequilibrium syndrome (DDS)
      i. Dialyzer membrane reaction- type a and b,
      j. Hemolysis,
      k. Air embolism,
      l. First use syndrome,
      m. Arrhythmias,
      n. Cardiac arrest,
      o. Cardiac tamponade,
      p. Hypertension,
      q. Exsanguinations,
      r. Seizures,
      s. Anaphylaxis.

4. Lab-data analysis
      a. Various laboratory test use assess kidney disease- urea, creatinine, GFR measurement, sodium, potassium, chloride, bicarbonate, serum uric acid, hemoglobin, phosphate, calcium, PTH, vitamin D level, albumin, cholesterol, blood glucose level-fasting, post-prandial and random, total protein, liver function tests, serum bilirubin, ALT, AST and urine analysis.
      b. Importance laboratory investigation of kidney disease
5. Introduction to peritoneal dialysis
      a. History of peritoneal dialysis
      b. Physiology of PD – Kinetics of PD,
      c. Three-pore model & Distributive Model

   d. Acute peritoneal dialysis
   e. Indications- Strong indications, PD preferences, non-renal indications
   f. Contraindications for chronic PD- relative contraindications to peritoneal dialysis and Peritoneal dialysis is not preferred but is possible in select circumstances.
6. Peritoneal dialysis apparatus
   a. Solution
   b. Transfer set,
   c. Connectologies.
   d. Access for PD
   e. Catheter and Exit site care
7. Peritoneal dialysis process & Therapies
   a. Assessment of peritoneal membrane permeability
   b. Adequacy of peritoneal dialysis
   c. PD therapies – intermittent & continuous
8. Peritoneal dialysis complications & management
   a. Non - infectious complications of PD
   b. Mechanical and metabolic complications
   c. Infectious complications of PD,
   d. Patient Education and Training
   e. Nutrition in PD
   f. Long term complications in PD
9. Pediatric dialysis
   a. Renal replacement therapy on children
   b. Complications of peritoneal dialysis in children
   c. Equipment required for pediatric chronic peritoneal dialysis.
   d. HD prescription in children
   e. Various vascular access for HD in children
   f. Dialysis machine and blood lines
   g. Extracorporeal blood access and circulation
   h. Immunization in children undergoing dialysis.
10. Pregnancy in dialysis patients
   a. Contraception
   b. Diagnosis of pregnancy in dialysis patients
   c. Hypertension in pregnant patients
   d. Drug removal
   e. Anemia
   f. Peritonitis occurrence
   g. Dialysis modalities- HD and PD
   h. Diet

Renal transplantation and coordination (60 Hours)

1. Introduction & Renal Transplantation
    a. Types of organ donors (Living and deceased donors)
    b. Types of deceased organ donors – Deceased heart beating donors and non-heart-beating donors
    c. Types of transplantation
    d. Indications and contraindications for transplantation
    e. Types of kidney transplantation
    f. Importance of immunosuppressive drugs in kidney transplantation
2. Brain stem death
    a. Define brain stem death
    b. List the tests to confirm brain stem death and their importance
    c. Explain the brain stem death importance in organ transplantation
    d. Explain the Human Organ Transplantation Act and ethical issues related to transplantation
3. Basics of immunology
    a. Define immunity, immunology, antibody, antigen and complement system
    b. Types of immunity (Innate & Acquired immunity)
    c. Explain the organs and cells involved in the immune system and their functions
    d. List the functions of the immune system
4. Immunology related to kidney transplantation.
    a. Define sensitivity and autoimmunity
    b. Causes for sensitization
    c. Immunological tests recommended during kidney transplantation
    d. Significance of blood groups in renal transplantation
    e. Define HLA, its location
    f. Types and significance of HLA
    g. Explain the HLA inheritance and its importance in renal transplantation
    h. Define cross-match test and panel reactive antibodies & list the importance of these tests
    i. Explain CDC, ELISA and flow cytometry tests
5. Renal Transplantation Procedure
    a. Explain the pre-renal transplant donor (Living and deceased) and recipient evaluation.
    b. Pre-transplant counselling of donor and recipient and importance of consent for organ donation
    c. Steps of preoperative preparation of the kidney donor and the recipient
    d. Types of nephrectomy methods (incision) and their importance
    e. List the organs/tissues/parts procured from the donor during nephrectomy
    f. Define warm and cold ischemia time.
    g. List the steps of kidney preservation.
    h. List the steps of kidney implantation.
    i. Explain the relative and absolute contraindications of living and deceased donor renal transplantation.

   j. Post-operative care of donor.
   k. Post-operative care of recipient –immediately after the transplant and long term follow up
6. Post renal transplantation.
   a. History of immunosuppressive drugs
   b. Define immunosuppressive drugs and list the importance of these drugs in renal transplantation
   c. Types of immunosuppressive drugs used for kidney transplantation Define induction therapy and list the drug names
   d. Define maintenance therapy and list the drug names
   e. Define triple therapy and list the drugs used under this therapy
   f. Complications/side effects of cyclosporine, tacrolimus, Azathioprine, MMF, Prednisolone, Sirolimus and ATG
   g. Explain the post-transplant complications (early and late) – Surgical, graft dysfunction and drug related complications
   h. Define the types of graft rejection and list the risk factors, features, and management
   i. Ethical and social issues related to dialysis and renal transplantation
7. Introduction to transplant coordination
   a. Define the term transplant coordinator
   b. Eligibility criteria for transplant coordinator
   c. Importance of transplant coordination team and their responsibilities
   d. Explain the role of kidney transplantation coordinator and coordination team
   e. Understand the work process of a transplant coordinator (routine)
   f. Explain the importance of consent for the organ donation
8. Living Donor kidney donation process
   a. Process of coordinating and monitoring living donor kidney transplantation
   b. Importance of document preparation for kidney transplantation
   c. Apply the acquired knowledge of transplantation for giving awareness about kidney disease and transplantation (Patient education)
9. Deceased donor kidney donation process
   a. Explain the process of identification of donor, declaration of brain stem death and evaluation of donor
   b. Explain the process of coordinating and monitoring the deceased donor kidney transplantation (Approaching the family members of donor, Coordination with regional committees, Allocation, Matching, organ procurement, storage, and transportation)
   c. Explain the process of creating a kidney transplantation registry
   d. Apply the acquired knowledge of transplantation giving awareness about deceased donor transplantation and becoming a deceased donor in the society
10. Introduction to grief counselling
   a. Define grief counselling and bereavement.
   b. Explain the grieving or bereavement process (Kubler Ross Model, Individual‟s mental status during grief)

11. Grief counselling and organ transplantation
    a. Explain how grief counselling is applied to end stage organ failure
    b. Explain the role of transplant coordinator during grief counselling
12. The functioning of transplant registration centers
13. Explain the functions of national, state or regional transplant registry services & registration centers
14. Human Organ Transplant Act and its amendments

CLINICAL PROBLEMS IN DIALYSIS & EVIDENCE BASED PRACTICE IN DIALYSIS THERAPY (60 Hours)

1. Anemia and ESA use
    a. Anemia in dialysis patient.
    b. Causes of anemia in CKD patient.
    c. Clinical features
    d. Diagnostic test
    e. Treatment.
2. Hypertension in dialysis patients
    a. Definition and measurement of hypertension.
    b. Pathophysiology of hypertension.
    c. Management of hypertension in dialysis patient.
    d. Various types of antihypertensive drugs used in end-stage kidney disease.
    e. Mechanism of intra-dialytic hypertension
3. Cardiovascular abnormalities
    a. Epidemiology of CVD in chronic kidney disease
    b. Risk factors for cardiovascular disease in dialysis patients.
    c. Left ventricular hypertrophy.
    d. Uremic pericarditis.
    e. Risks of dialysis therapy in patients with pericarditis
4. Psychological aspect in dialysis patients
    a. Common psychologic problem in ESRD patients
    b. Depression
    c. Dementia
    d. Anxiety and behavioral disorders
    e. Other psychologic problems- marital issues, sexual dysfunction, socioeconomic issues, rehabilitation, quality of life (QOL)
5. Blood borne disease in dialysis patients
    a. Major blood borne infection in dialysis patient
    b. Hepatitis B infection in dialysis patient
    c. Interpretation of diagnostic test in hepatitis b infection
    d. Epidemiology of hepatitis B virus in dialysis units
    e. Hepatitis B vaccination
    f. Hepatitis C infection in dialysis patient
    g. Interpretation of diagnostic test in hepatitis c infection
    h. Epidemiology of hepatitis C virus in dialysis units
    i. Human immunodeficiency virus (HIV) infection in dialysis patient

   j. Clinical manifestations of HIV
   k. Management of HIV infection
   l. Dialysis in patients who are HIV positive
   m. Prevention of blood borne infection in dialysis patients
6. Endocrine disturbances
   a. CKD and endocrine abnormalities.
   b. Effects of Thyroid Dysfunction on the Kidney
   c. Various hormones like insulin, glucagon, renin–angiotensin, aldosterone, norepinephrine and epinephrine, cortisol, thyroid function, testicular function, growth hormone, parathyroid hormone (PTH), sexual dysfunction in men and women, and its effect on dialysis patient.
7. Bone disease
   a. Renal Bone disease.
   b. Chronic Kidney Disease –Mineral and Bone Disorder.
   c. Role of PTH, Vitamin D, and Fibroblast Growth Factor-23.
   d. Development of secondary hyperparathyroidism in CKD
   e. Classification bone diseases in CKD patients
   f. Medical treatments of CKD-MBD.
   g. Role of optimal dialysis prescription in CKD – MBD.
8. Neurologic aspects of uremia
   a. Neurological problems in dialysis patients.
   b. Uremic encephalopathy.
   c. Acute aluminum intoxication.
   d. Acute cerebral dysfunction during or immediately after dialysis.
   e. Stroke in dialysis patient.
   f. Physical disability in dialysis patient.
   g. Peripheral neuropathy
   h. Carpel tunnel syndrome
   i. Autonomic neuropathy and myopathy
   j. Sleep disorders in dialysis patients.
9. APKD
   a. Introduction
   b. Pathologic features
   c. Clinical manifestations
   d. Diagnosis and differential diagnosis
   e. Management
   f. Outcome
10. Dialysis amyloidosis
   a. Define amyloidosis.
   b. Risk factors for dialysis related amyloidosis.
   c. Pathophysiology of amyloidosis.
   d. Clinical and laboratory manifestations of amyloidosis.
   e. Symptoms of amyloidosis.
   f. Treatment of amyloidosis

11. Geriatric Dialysis
    a. RRT in geriatric patient.
    b. Features of ageing in CKD patients.
    c. Choice of modality for geriatric patients‟ dialysis.
    d. Lifestyle benefits from the patient perspective
    e. QOL for geriatric patients on dialysis
    f. Falls and factors associated with falls in dialysis patients.
    g. Dialysis related risk factors in geriatric patients.
12. Malnutrition
    a. Epidemiology
    b. Pathogenesis
    c. Nutritional assessment
    d. Supplementation
13. Skin Disorders
    a. Dermatologic manifestations of disease
        a. related with ESRD
        b. related with uremia
    b. related with renal transplant
    c. Management
    d. Treatment
14. GI Disorders
    a. GI symptoms in kidney disease
    b. Gastritis, duodenitis, upper gastrointestinal hemorrhage
    c. Diseases of the colon
    d. Gastroparesis
    e. Management and treatment

Advanced extracorporeal therapies (60 Hours)

1. Hi-flux and Hi-efficiency
    a. Hi-flux dialysis and its characteristics
    b. Hi-efficiency dialysis and its characteristics
2. Slow continuous therapies
    a. Multidisciplinary team
    b. indications of CRRT
    c. vascular access used and extracorporeal circuit
    d. types of CRRT- SCUF, C-HD, C-HF, C-HDF
    e. contraindications of CRRT
    f. complications of CRRT
3. SLED
    a. Describe slow low efficiency dialysis (SLED).
    b. indication and contraindication of SLED.
    c. advantages and disadvantages of SLED.
    d. equipment used for SLED.
    e. prescription of SLED

4. Plasmapheresis
    a. Indication and contraindication.
    b. Pharmacokinetics of immunoglobulin removal
    c. Pharmacokinetic basis for TPE prescriptions.
    d. How to estimate plasma volume.
    e. Various replacement solutions used in Plasmapheresis.
    f. Various complication of Plasmapheresis.
    g. Double filtration plasmapheresis
5. Hemoperfusion
    a. Indications of hemoperfusion
    b. Choice of therapy for the treatment of poisoning
    c. Technical requirements for hemoperfusion
    d. Complications occurs during hemoperfusion
6. Principle of ICU care
    a. Ventilator – Mode and operation
    b. Dialysis in ICU
    c. Basics of ICU management
    d. Basics of ECG
7. Common uro-surgical procedures
    a. Common urosurgical procedures
    b. Instruments & their management
    c. ESWL
8. Liver Dialysis/ Extracorporeal Albumin Dialysis
    a. Indications and contraindications
    b. Toxins cleared in Liver Dialysis
    c. Liver Dialysis system & Types
    d. Principles
    e. Process
    f. Types of treatment
    g. Complications and Management
9. ECMO
    a. Indication & Contraindications
    b. Principles
    c. Risk of ECMO
    d. Preparation and expectation of ECMO
    e. ECMO & Dialysis
10. Hemodiafiltration
    a. Introduction
    b. Preparation replacement fluid
    c. Techniques of HDF
    d. Technical aspects
    e. Advantages and disadvantages

11. Sorbent Dialysis
    a. Introduction
    b. Requirements
    c. Sorbent cartridge and its function
    d. Parameters of sorbent system
    e. Serum electrolytes and acid base adjustments
    f. Uses
    g. Conclusion
12. Adsorption techniques
    a. Introduction
    b. Basic principles
    c. Extracorporeal techniques using adsorption
    d. Extracorporeal filtration in adsorption systems
    e. Clinical experiences with high filtrate reinfusion (HFR)

Renal transplantation and coordination Practical's (60 Hours)

1. Renal transplants work up.
2. Grief Counseling
3. Transplant Counseling

Advanced extracorporeal therapies Practical (60 Hours)

1. Conducting dialysis for-
    a. Patient with congestive heart failure (CHF)
    b. Advanced liver disease
    c. Patient positive for HCV, HIV & HBsAg
    d. Acute rejection and failed transplant
    e. Poisoning patient
    f. Pregnancy
    g. Dialysis in infants and children
    h. Application of ECMO

Dialysis Therapies – Part II Practical's (60 Hours)

1. Hemodialysis procedure
   Patient assessment, management and prevention– General, pre, intra and post dialysis
   Lab data analysis
   Machine monitoring during hemodialysis
2. Hemodialysis prescription
   Design Acute hemodialysis prescription
   Design Chronic hemodialysis prescription
3. Manage Acute complication
   Hypotension,
   Muscle cramps,
   Nausea and vomiting,
   Chest pain and back pain,
   Fever and chills,

Itching,
Headache,
Dialysis disequilibrium syndrome (DDS)
Dialyzer membrane reaction- type a and b,
Hemolysis,
Air embolism,
First use syndrome,
Arrhythmias,
Cardiac arrest,
Cardiac tamponade,
Hypertension,
Exsanguinations,
Seizures,
Anaphylaxis.

4. Identify Peritoneal dialysis apparatus
   Solution
   Transfer set,
   Connectologies.
   Access for PD
5. Calculate Peritoneal dialysis adequacy & PET
6. Manage Peritoneal dialysis complications
   Non - infectious complications of PD
   Mechanical and metabolic complications
   Infectious complications of PD,
7. Educate and Train Patient for PD
8. Perform Pediatric dialysis
   Equipment required for pediatric chronic peritoneal dialysis.
   HD prescription in children
   Various vascular access for HD in children
   Dialysis machine and blood lines
   Extracorporeal blood access and circulation
   Immunization in children undergoing dialysis.
9. Plan to perform dialysis in Pregnancy

Clinical Postings IV (180 Hours)

Students will gain additional skills in clinical procedures, interaction with patients and professional personnel. Students apply knowledge from previous clinical learning experience under the supervision of a senior dialysis therapist. Students are tested on intermediate clinical dialysis therapy skills.

Areas to be covered:

- Dialysis unit
- ICU
- Renal transplants work up.
- Operation Theater for Observing AVF/AVG Creation, PD catheter Insertion & Renal Transplantation.

Sixth Semester

Recent Advancements in Renal replacement therapies (90 Hours)

i. Current research and recent advances in dialysis technology
   a. Newer dialysis technologies
   b. Wearable artificial kidney
   c. Bio artificial kidney
   d. New sorbent technologies

ii. Information technology and dialysis
   a. TDMS
   b. Patient Online
   c. Web based education.
   d. Short message service (SMS) texting
   e. Mobile apps
   f. Telemedicine in dialysis practice
   g. Other IT delivery methods

iii. Home Hemodialysis
   a. Indications and contraindications of home hemodialysis
   b. Technical aspect of dialysis- legal, water preparation (plumbing), electrical considerations including backup power supply, dialysis machine choice and other equipment, space considerations and siting of dialysis machine, hygiene and noise, safety, medical staff and technical support, disposal of waste, storage of medication
   c. Psychological aspect of home hemodialysis.
   d. Advantages and disadvantages of conventional home dialysis
   e. Impact on daily hemodialysis

iv. Nocturnal hemodialysis
   a. Brief note on nocturnal hemodialysis
   b. Advantages of longer, slower dialysis
   c. Nocturnal dialysis in a dialysis center

v. Artificial Intelligence in renal replacement therapies

vi. Other Recent Advances in Dialysis Therapy

vii. Application of nanotechnology, microfluidics, bioreactors with kidney cells, and miniaturized sorbent systems

viii. New Techniques of Pediatric Dialysis
   a. NIDUS
   b. Carpediem

Principals of management (45 Hours)

i. Introduction to Management
   a. Introduction
   b. Definition
   c. Steps
   d. Planning
   e. Organizing
   f. Staffing
   g. Directing
   h. Controlling

ii. Introduction to Clinical service Types of Hospitals
    a. Organization and administration of various clinical services: Outpatient services- In-patient services, Emergency services, Operation theatres, Nursing services and ICU,,s.
iii. Hospital Support services
    a. Organization and Administration of various Support services
        - CSSD
        - Diet
        - Medical records
iv. Hospital Ancillary Services
    a. Organization and Administration of various Ancillary services:
        - Housekeeping – Linen and Laundry-
        - Engineering services – Transportation
v. Hospital Diagnostic and Therapeutic services
    a. Organization and Administration of various Diagnostic and Therapeutic services:
        - Radiology
        - Laboratory
        - Pharmacy
        - Blood bank
vi. Safety and Risk management
    a. Hospital waste management
    b. Nosocomial infection
    c. Disaster management
    d. Hospital security service
    e. Occupational safety in hospitals

Introduction to quality assurance in dialysis and patient safety (75 Hours)

1. Quality assurance in Hemodialysis
    a. Dialysis Adequacy
    b. Infection control in dialysis unit
    c. Universal Precaution
    d. RO water quality monitoring
    e. Hemodialysis unit management
    f. Quality indicators in Hemodialysis
    g. Hazardous materials use and safety in Hemodialysis
    h. Disaster management in Hemodialysis unit
    i. NABH Standards
    j. JCI standards
2. Hemodialysis Vascular Access Surveillance
    a. Clinical monitoring of vascular access
    b. Recirculation
    c. Flow based techniques
    d. Rule of Six in AV fistula
    e. Pressure based techniques
    f. Other surveillance techniques

3. Quality Assurance in Peritoneal Dialysis
    a. Peritoneal dialysis quality management
    b. Kinetic Modeling in peritoneal dialysis
    c. Peritoneal Dialysis patient and catheter survival
    d. Quality improvement in peritoneal dialysis
    e. Quality indicators in peritoneal dialysis
4. Quality Assurance in Renal transplantation coordination
    a. Quality indicators in renal transplantation
    b. Graft and Patient survival in renal transplantation
    c. Assessment techniques for renal donors and recipients
5. Safety in dialysis
    a. IPSG
    b. Advanced disaster preparedness
    c. Preparations to perform an emergency dialysis
    d. Fire safety
    e. Safety access of needle
    f. Violence at dialysis unit
    g. Employee safety
    h. Electrical safety in dialysis unit
    i. Emergency evacuation.
    j. Infection control

Basic and advanced cardiac life support (30 Hours)

1. BLS & ACLS
2. The universal algorithm for adult ECC
3. Ventricular fibrillation/Pulseless ventricular tachycardia algorithm
4. Pulseless electrical activity (PEA) / asystole algorithm
5. Bradycardia treatment algorithm
6. Tachycardia Treatment algorithm
7. Hypotension / Shock
8. Acute myocardial infarction
9. Paediatric Advanced life support
10. Airway management
11. Defibrillation
12. Drugs used in ACLS
13. Emergency Cardiac pacing
14. AED
15. Techniques for oxygenation and ventilation
16. Role of dialysis technologist & dialysis therapist.

Recent Advancements in Renal replacement therapies: Practicals (60 Hours)

1. Current research and recent advances in dialysis technology
    a. Newer dialysis technologies
    b. Wearable artificial kidney
    c. Bio artificial kidney
    d. New sorbent technologies
2. Information technology and dialysis
    a. TDMS
    b. Patient Online
    c. Web based education.
    d. Short message service (SMS) texting
    e. Mobile apps
    f. Telemedicine in dialysis practice
    g. Other IT delivery methods
3. Home Hemodialysis
    a. Indications and contraindications of home hemodialysis
    b. Technical aspect of dialysis- legal, water preparation (plumbing), electrical considerations including backup power supply, dialysis machine choice and other equipment, space considerations and siting of dialysis machine, hygiene and noise, safety, medical staff and technical support, disposal of waste, storage of medication
    c. Psychological aspect of home hemodialysis.
    d. Advantages and disadvantages of conventional home dialysis
    e. Impact on daily hemodialysis
4. Nocturnal hemodialysis
    a. Brief note on nocturnal hemodialysis
    b. Advantages of longer, slower dialysis
    c. Nocturnal dialysis in a dialysis center
5. Artificial Intelligence in renal replacement therapies
6. Application of nanotechnology, microfluidics, bioreactors with kidney cells, and miniaturized sorbent systems
7. New Techniques of Pediatric Dialysis
    a. NIDUS
    b. Carpediem
8. Other Recent Advances in Dialysis Therapy

Basic and advanced cardiac life support practical (30 Hours)

1. ACLS and BLS
2. Use of defibrillator and AED
3. Management of Shock and Hypotension

Clinical Postings (270 Hours)

Students will continue with their previous clinical procedures and other special procedures with the assistance of a senior dialysis technologist. They are also allowed to view the renal transplant procedure along with internee.

Areas to be covered:

- Dialysis unit
- ICU
- Operation Theater for Observing AVF/AVG Creation, PD catheter Insertion & Renal Transplantation.
- BLS and ACLS

Seventh and Eighth Semester

Compulsory Rotatory Internship (2160 Hours)

The internship will span 1 year/ 2 semesters. This will include 8 hours of practice a day, totaling to 2160 hours for two semesters.

As a part of this, the students will choose a relevant subject and prepare an in-depth project report of not less than 1000 words which will be handed over to the supervisor or trainer. The report can include objective, scope of the project and an in-depth report.

The internship time period provides the students the opportunity to continue to develop confidence and increased skill in simulation and treatment delivery. Students will demonstrate competence in beginning and intermediate procedures. Students will observe the advanced and specialized treatment procedures. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. The students are expected to work for minimum 8 hours per day and this may be more depending on the need and the healthcare setting.

Project / Thesis/ Dissertation (180 Hours)

Each candidate will have to carry out a dissertation/ Project on the related subject. The dissertation will be guided by one or two members of the faculty of the department.

Elective Courses

Introduction to Healthcare Delivery System in India (30 Hours)

The course provides the students a basic insight into the main features of Indian health care delivery system and how it compares with the other systems of the world. Topics to be covered under the subject are as follows:

1. Introduction to healthcare delivery system
    a. Healthcare delivery system in India at primary, secondary and tertiary care
    b. Community participation in healthcare delivery system
    c. Health system in developed countries.
    d. Private Sector
    e. National Health Mission

   f. National Health Policy
   g. Issues in Health Care Delivery System in India
2. National Health Program- Background objectives, action plan, targets, operations, achievements and constraints in various National Heath Program
3. Introduction to AYUSH system of medicine
   a. Introduction to Ayurveda.
   b. Yoga and Naturopathy
   c. Unani
   d. Siddha
   e. Homeopathy
   f. Need for integration of various system of medicine
4. Health scenario of India- past, present and future
5. Demography & Vital Statistics-
   a. Demography – its concept
   b. Vital events of life & its impact on demography
   c. Significance and recording of vital statistics
   d. Census & its impact on health policy
6. Epidemiology
   a. Principles of Epidemiology
   b. Natural History of disease
   c. Methods of Epidemiological studies
   d. Epidemiology of communicable & non-communicable diseases, disease transmission, host defense immunizing agents, cold chain, immunization, disease monitoring and surveillance.

Basic computers and information science (45 Hours)

The students will be able to appreciate the role of computer technology. The course has focus on computer organization, computer operating system and software, and MS windows, Word processing, Excel data worksheet and PowerPoint presentation. Topics to be covered under the subject are as follows:

1. Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.
2. Input output devices: Input devices (keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices (monitors, pointers, plotters, screen image projector, voice response systems).
3. Processor and memory: The Central Processing Unit (CPU), main memory.
4. Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.
5. Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).

6. Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.
7. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.
8. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.
9. Introduction of Operating System: introduction, operating system concepts, types of operating system.
10. Computer networks: introduction, types of networks (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.
11. Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.
12. Application of Computers in clinical settings.

Practical on fundamentals of computers –

1. Learning to use MS office: MS word, MS PowerPoint, MS Excel.
2. To install different software.
3. Data entry efficiency

Communication, soft skills & English (30 Hours)

Topics to be covered under Communication & Soft Skills course –

1. Basic Language Skills: Grammar and Usage.
2. Business Communication Skills. With focus on speaking - Conversations, discussions, dialogues, short presentations, pronunciation.
3. Teaching the different methods of writing like letters, E-mails, report, case study, collecting the patient data etc. Basic compositions, journals, with a focus on paragraph form and organization.
4. Basic concepts & principles of good communication
5. Special characteristics of health communication
6. Types & process of communication
7. Barriers of communication & how to overcome

Topics to be covered under English course –

1. Spoken Communication
    a. Learning to read the phonetic symbols
    b. Stress
    c. Intonation
    d. Rhythm
    e. Commonly mispronounced words
    f. Correct pronunciation of important commonly used words in hospital practice

2. Vocabulary and Reading
    a. Special features of English vocabulary
    b. Common errors in choice of word
    c. Semi technical vocabulary
    d. Collecting material from library on scientific topics
    e. Comprehensive exercises
3. Writing
    a. Writing letters regarding permission, leave, opening bank account etc.
    b. Taking notes from lecture / reading materials
    c. Writing reports on patient care
    d. Summarizing scientific passages
4. Grammatical and Idiomatic Usage
    a. Correction of errors
    b. Types of interrogative sentences
    c. Active-Passive voice
    d. Tense
    e. Principles of procession, clarity and specificity

Competency

Professional conduct: Backed by philanthropy, compassion, integrity, and excellence, a dialysis technologist is to adhere to the utmost conduct of professionalism. They are to provide their services, to patients with renal failure requiring renal replacement therapies, with professional codes and ethical conduct as their core values. They are to be a team player, effective in communication, provide the best care, to keep the patients safe & protected. They are to understand their limitations while continuing to keep themselves educated and updated with the current dialysis therapy practices.
Competency Link: Curriculums - National Commission for Allied and Healthcare Profession

Bachelor of Dialysis Therapy Technology Log Book

Instructions

1. Following log book should be maintained for all Six Semesters.
2. Print out of the sheets may be depended on the no. of cases/ clinical quota mentioned in chapter 4.
3. Certificate of the Log Book should be only signed after end of each year.
4. Log book has been divided into four sections. One section for each year.
5. Log book needs to be checked & verified daily.
6. Posting Areas for Each Semesters:

Section	Semester	Posting Area
Section 1	Semester 1 & Semester 2	Nephrology OPD, Nephrology Ward, Dialysis Unit & Procedure Room for Assisting in Renal Biopsy
Section 2	Semester 3 & Semester 4	Nephrology OPD, Nephrology Ward, Dialysis Unit & Procedure Room for Assisting in Renal Biopsy, Central Venous Catheterization & PD Catheterization
Section 3	Semester 5 & Semester 6	Dialysis unit, ICU, Renal transplants work up, Operation Theater for Observing AVF/AVG Creation, PD catheter Insertion & Renal Transplantation.