REGULATIONS & CURRICULUM OF GRADUATE PARAMEDICAL COURSE

BACHELOR OF SCIENCE IN

RENAL DIALYSIS TECHNOLOGY

2020

Sri Siddhartha Academy of Higher Education Deemed-to-be-University

Established under Section 3 of the UGC Act, 1956
MHRD, GOI No. F.9-31/2006-U.3 (A) Dtd. 30th May 2008

Agalakote, B.H. Road, Tumkur – 572107, Karnataka, India

SRI SIDDHARTHA ACADEMY OF HIGHER EDUCATION

(DEEMED TO BE UNIVERSITY)

Declared under Section 3 of the UGC Act, 1956, MHRD GOI No. F.9-31/2006-U.3 (A) Dated: 30/05/2008

Accredited 'A' Grade by NAAC

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No. SSAHE/ACA-S&C(AHSP)/16/2022 Date: 01/09/2022

NOTIFICATION

Sub: Ordinance pertaining to Regulations and Curriculum of Bachelor of Science in Renal Dialysis Technology.

Ref: 1). Proceedings of BOS Allied Health Sciences Programmes held on 06/04/2021
2). Proceedings of the Academic Council meeting held on 19/08/2021
3). Proceedings of the Board of Management held on 29/08/2022

In exercise of the powers vested under section 6 of 6.4 of MoA / Rules of SSAHE, the Ordinance pertaining to Regulations and Curriculum of Bachelor of Science in Renal Dialysis Technology is notified herewith as per Annexure.

The above Regulations shall be applicable to the students admitted to the said course from the academic year 2020-21 onwards.

By Order,

REGISTRAR

REGISTRAR
Sri Siddhartha Academy of Higher Education
TUMKUR - 572 107, Karnataka.

To,
Dean / Principal, Sri Siddhartha Medical College & Hospital,

Copy to
1) Office of the Chancellor, SSAHE, for kind information,
2) PA to Vice-Chancellor / PA to Registrar / Controller of Examinations / Finance Officer, SSAHE
3) The Director (AHSP), SSAHE
4) All Officers of the Academy Examination Branch / Academic Section
5) Guard File / Office copy.

REVISED ORDINANCE GOVERNING REGULATIONS & CURRICULUM OF B. Sc RENAL DIALYSIS TECHNOLOGY-2020

1. Eligibility for admission:

A candidate seeking admission to the B.Sc. Renal Dialysis Technology shall have studied English as one of the principal subject during the tenure of the course and shall have passed:

1. Two year Pre-University examination or equivalent as recognised by Sri Siddhartha Academy of Higher Education with, Physics, Chemistry and Biology as subjects of study.

OR

2. Pre-Degree course from a recognised University considered as equivalent by SSAHE, (Two years after ten years of schooling) with Physics, Chemistry and Biology as subjects of study.

OR

3. Any equivalent examination recognised by the Sri Siddhartha Academy of Higher Education, Tumkur for the above purpose with Physics, Chemistry and Biology as subjects of study.

OR

4. The vocational higher secondary education course conducted by Vocational Higher Secondary Education, Government of Kerala with five subjects including Physics, Chemistry, Biology and English in addition to vocational subjects conducted is considered equivalent to plus TWO examinations of Government of Karnataka Pre University Course.

OR

5. Candidates with two years diploma from a recognised Government Board in Renal Technology shall have passed class 12 [10+2] with Physics, Chemistry and Biology, as subjects or candidates with 3 years diploma from a recognised Government Board in Renal Dialysis Technology should have studied Physics, Biology and Chemistry as subjects during the tenure of the course.

6. Lateral entry to the second Year of B.Sc.Renal Dialysis Technology for candidates who have passed diploma program from the Government Boards and recognised by SSAHE, fulfilling the conditions specified a bove under Sl. No. 5 and these students are eligible to take admission on lateral entry system only in the sam e subject studied at diploma level for the academic year.

Note:

a. The candidate shall have passed individually in each of the subjects.

b. Candidates who have completed diploma or vocational course through Correspondence shall not be eligible for any of the courses mentioned above.

2. Duration of the course:

Duration shall be for a period of four years including one Year of Internship.

3. Medium of instruction:

The medium of instruction and examination shall be in English.

4. Scheme of examination:

There shall be three examinations, one each at the end of 1 st, 2^{nd} ,3^{rd} Year and Practical examination 4^{th} Year.

5. Attendance

Every candidate should have attended at least 80% of the total number of classes conducted in an academic year from the date of commencement of the term to the last working day as notified by University in each of the subjects prescribed for that Year separately in Theory and practical. Only such candidates are eligible to appear for the university examinations in their first attempt. Special classes conducted for any purpose shall not be considered for the calculation of percentage of attendance for eligibility. A candidate lacking in prescribed percentage of attendance in any subjects either in Theory or practical in the first appearance will not be eligible to appear for the University Examination in that subject

• The marks of the internal assessment must be displayed on the notice board of the respective colleges with in a fortnight from the date test is held.

• If a candidate is absent for anyone of the tests due to genuine and satisfactory reasons, such a candidate may be given a re-test within a fortnight.

6. Internal Assessment (IA):

<u>1st Year B.Sc. Renal Dialysis</u>

Theory - 20 marks

Practicals - 10 marks*. [Lab work- 06 marks and Record-04 marks]

<u>2nd & 3rd year B.Sc. Renal Dialysis</u>

Theory – 20 Marks

Practicals – 20 Marks

There shall be a minimum of two periodical tests, preferably one in each term in Theory and Practical of each subject in an academic year. The average marks of the two tests will be calculated and reduced to 20. The marks of IA shall be communicated to the University at least 15 days before the commencement of the University examination. The University shall have access to the records of such periodical tests. The marks of the internal assessment must be displayed on the notice board of the respective colleges within a fortnight from the date test is held. If a candidate is absent for anyone of the tests due to genuine and satisfactory reasons, such a candidate may be given a re-test within a fortnight.

* There shall be no University Practical Examination in First Year.

7. Subject and hours of teaching for Theory and Practicals

The number of hours of teaching theory and practical, subject wise in first Year, second Year and third Year are shown in Table-I, Table-II and Table-III

Main and Subsidiary subjects are common in First Year for all the courses in Allied Health Science.

Table - I : Distribution of Teaching Hours in First Year Subjects

Main subjects

Paper	Subjects	Theory No. of Hours	Practical No. of Hours	Total No. of Hours
1	Basic Anatomy (Including Histology)	70	20	90
2	Physiology	70	20	90
3	Biochemistry	70	20	90
4	Pathology I (Clinical Pathology, Haematology& Blood Banking)	70	20	90
5	Microbiology	70	20	90
	Total	**350**	**100**	**450**

The classes in main and subsidiary subjects are to be held from Monday to Thursday. On Fridays and Saturdays, students shall work in hospitals in the respective speciality or department chosen by them

Subsidiary Subjects

English 25 Hours
Kannada 25 Hours
Health Care 40 Hours

Clinical/Lab posting –470 hours. (Friday 9 am – 1 pm and 2 pm - 4-30 pm Saturday 9 am - 1 pm).

Table - II Distribution of Teaching Hours in Second Year Subjects

Main Subjects

Paper	Subjects	Theory -No. of Hours	Practical- No. Of Hours	Clinical Postings	Total No. of Hours
1	Applied anatomy & physiology related to dialysis technology	80 (40+40)	30 (15+15)		110
2	Pharmacology related to Haemodialysis and Peritoneal Dialysis	70	10		80
3	Concepts of renal disease: Clinical manifestation and its management	70	10		80
4	Applied aspects of pathology & microbiology	80	30 (15+15)		110
5	Basics of Renal Dialysis Technology	80	30	750	860
	Total	**380**	**110**	**750**	**1240**

Subsidiary Subject:

Nutrition – 20 Hours

Table - III Distribution of Teaching Hours in Third Year Subjects

Main Subjects

Paper	Subjects	Theory Number of hours	Practical Number of hours	Clinical posting	Total No
1	Applied Dialysis Technology Paper I	70	100	520	670
2	Applied Dialysis Technology Paper-II	70	100	520	670
Total		**140**	**200**	**1040**	**1380**

Subsidiary Subjects:

1. Medico-legal aspects of health care 20 Hours
2. Basic principles of blood transfusion & fluid therapy 10 hours
3. Health care management 20 hours

8. Schedule of Examination:

The University shall conduct two examinations annually at an interval of not less than 4 to 6 months as notified by the University from time to time. A candidate who satisfies the requirement of attendance, progress and conduct as stipulated by the University shall be eligible to appear for the university examination. Certificate to that effect shall be produced from the Head of the institution along with the application for examination and the prescribed fee.

9. Scheme of Examination

There shall be three theory examinations, one each at the end of I,II and III year. The examination for both main and subsidiary subjects for all courses in Allied Health Sciences shall be common in the First Year. Distribution of Subjects and marks are shown in Table – IV, V, VI & VII.

First year examination:
The University examination for 1st Year shall consist of only theory examination, and there shall be no University Practical Examination.
Written Examinations consists of

- 05 papers in the First Year.

Second & Third-year examination:
The University examination for second and 3rd Year shall consist of Written Examination &Practical.

Written Examinations consists of

- 05 papers in the 2nd Year
- 02 papers in the 3rd Year.

Practical examination:

- Two practical examinations, at the end 2nd Year
- Two practical examinations at the end of the 3rd Year, Common practical Exam for two papers with an equal weightage of marks

Fourth Year Practical Examination:
End of the fourth Year, Practical Exam will be conducted based on the clinical practice during internship

TABLE-IV
Distribution of Subjects and marks for First-Year University theory Examination

		Written Exam		IA Theory	Total
Paper	**Subject**	**Duration**	**Marks**	**Marks**	**Marks**
1	Basic Anatomy (Including Histology)	3 Hours	80	20	100
2	Physiology	3 Hours	80	20	100
3	Biochemistry	3 Hours	80	20	100
4	Pathology	3 Hours	80	20	100
5	Microbiology	3 Hours	80	20	100
	Subsidiary Subject**				
1	English	3 Hours	80	20	100
2	Kannada	3 Hours	80	20	100
3	3 Health Care	3 Hours	80	20	100

Note: I A = Internal Assessment

*Main Subjects shall have University Examination.
There shall be no University Practical Examination
**Subsidiary subjects: Examination for subsidiary subjects shall be conducted by respective colleges.

TABLE – V

Distribution of Subjects and marks for Second Year Examination of B.Sc. Renal Dialysis

		Theory			Practical			
Paper	**Subjects**	**Univ. Exam**	**IA**	**Sub Total**	**Practical Exam**	**IA**	**Sub Total**	**Total**
1	Applied anatomy and physiology related to dialysis technology	80	20	100	No Practical	-	-	100
2	Pharmacology related to Haemodialysis and Peritoneal Dialysis	80	20	100	No Practic	-	-	100
3	Concepts of renal disease: Clinical manifestation and its management	80	20	100	No Practical	-	-	100
4	Applied aspects of Pathology and Microbiology	80	20	100	80	20	100	200
5	Basics of Renal Dialysis Technology	80	20	100	80	20	100	200

Distribution of Subsidiary Subjects and marks for Second Year Examination of B.Sc. Renal Dialysis

Sl No	Subjects	Duration	Marks	IA Marks	Total
1	Nutrition	3 Hours	80	20	100

Note: I A = Internal Assessment

**Subsidiary subjects: Examination for subsidiary subjects shall be conducted by respective colleges.

TABLE – VI

Distribution of Subjects and marks for Third Year Examination of B.Sc Renal Dialysis

		Theory			Practical			
Paper	Subject	Univ. exam	IA	Sub Total	Univ. Practical*	IA	Sub Total	Grand Total
I.	Applied dialysis Technology paper-I	80	20	100	160 (80 + 80)	40 (20+20)	200	400
II	Applied Dialysis Technology Paper-II	80	20	100				

*****Common practical Exam for two papers with an equal weightage of marks.

Distribution of Subsidiary Subjects and marks for Third Year Examination of B.Sc. Renal Dialysis

Paper	Subjects	Duration	Marks	I A Marks	Total Marks
1	Medico-legal aspects of health care	3 Hours	80	20	100
2	Basic principles of blood transfusion & fluid therapy	3 Hours	80	20	100
3	Health care management	3 Hours	80	20	100

** Subsidiary subjects: Examination for subsidiary subjects shall be conducted by respective colleges

TABLE – VII

Distribution of Subjects and marks for 4th Year Practical Examination of B.Sc. Renal Dialysis

		Theory			Practical			
Paper	Subject	Univ Exam	IA	Sub Total	Practical Exam	IA	Sub Total	Total
1.	Practical	-	-	-	170	30	200	200

10. Pass criteria

10.1. First-year examination

a. Main Subjects: A candidate is declared to have passed in a subject, if he/she secures,50% of marks in University Theory exam and internal assessment added together.

b. Subsidiary Subjects: The minimum prescribed marks for a pass in subsidiary subject shall be 35% of the maximum marks prescribed for a subject. The marks obtained in the subsidiary subjects shall be communicated to the University before the commencement of the University examination.

10.2. Second and Third year Examination

a. Main Subjects: A candidate is declared to have passed the examination in a subject if he/she secures 50% of the marks in Theory and 50% in practical separately. For a pass in Theory, a candidate has to secure a minimum of 40% marks in the University conducted written examination, and 50% in aggregate in the University conducted written examination and internal assessment added together and for pass in Practical, a candidate has to secure a minimum of 40% marks in the University conducted Practical/Clinical examination and 50% in aggregate i.e. University conducted Practical/Clinical and Internal Assessment.

b. Subsidiary Subjects: The minimum prescribed marks for a pass in subsidiary subject shall be 35% of the maximum marks prescribed for a subject. The marks obtained in the subsidiary subjects shall be communicated to the University before the commencement of the University examination.

11. Carryover benefit

11.1 First year examination:

A candidate who fails in any two of the five main subjects of first Year shall be permitted to carry over those subjects to second Year. However, he/ she must pass the carry over subjects before appearing for second year examination.

11.2. Second year examination:

A candidate is permitted to carry over anyone main subject to the third year but shall pass this subject before appearing for the third year examination.

12. Declaration of Class

a. A candidate having appeared in all the subjects in the same examination and passed that examination in the first attempt and secures 75% of marks or more of grand total marks prescribed will be declared to have passed the examination with Distinction.

b. A candidate having appeared in all subjects in the same examination and passed that examination in the first attempt and secures 60% of marks or more but less than 75% of grand total marks prescribed will be declared to have passed the examination in First Class.

c. A candidate having appeared in all the subjects in the same examination and passed that examination in the first attempt and secures 50% of marks or more but less than60% of grand total marks prescribed will be declared to have passed the examination in Second Class.

d. A candidate passing the university examination in more than one attempt shall be placed in Pass class irrespective of the percentage of marks secured by him/her in the examination.

e. The marks obtained by a candidate in the subsidiary subjects shall not be considered for award of Class or Rank.

[Please note, fraction of marks should not be rounded off clauses (a), (b) and (c)

13. Eligibility for the award of Degree:

A candidate shall have passed in all the subjects of first, second and third year to be eligible for a compulsory 12 months of rotational internship. On completion of 12 months of the internship with pass criteria in outgoing clinical assessment exams the candidate is then eligible for the award of degree

14. Distribution of Type of Questions and Marks

SUBJECTS HAVING MAXIMUM MARKS= 80 (for **First year)**		
Type of Questions	No. of Questions	Marks for Each Questions
Long Essay	1	10
Short Essay	5	5
Short Notes Type	5	3
Short Answer Type	10	2
MCQ's	10	1

1. Long essay- 1 Questions (answer any one)	1x10= 10 marks
2. Short essay- 7 Questions (answer any five)	05x5= 25 marks
3. Short Notes Type – 8 Questions (answer any five)	05x3= 15 marks
4. Short answer- 12 Questions (answer any ten)	10x2= 20 marks
5. MCQ's – 10 Questions	10x1= 10 marks
	Total= 80

SUBJECTS HAVING MAXIMUM MARKS= 80 (for **Second and Third Year)**		
Type of Questions	No. of Questions	Marks for Each Questions
Long Essay	1	10
Short Essay	5	5
Short Notes Type	5	3
Short Answer Type	10	2
MCQ's	10	1

1. Long essay- 1 Questions (answer any one)	1x10= 10 marks
2. Short essay- 7 Questions (answer any five)	05x5= 25 marks
3. Short Notes Type – 8 Questions (answer any five)	05x3= 15 marks
4. Short answer- 12 Questions (answer any ten)	10x2= 20 marks
5. MCQ's – 10 Questions	10x1= 10 marks
	Total= 80

SUBJECTS HAVING MAXIMUM MARKS= 80 (for **Subsidiary subjects)**		
Type of Questions	No. of Questions	Marks for Each Questions
Essay Type	3 (2 x 10)	10
Short Essay Type	8 (6 x 5)	05
Short Answer Type	12 (10 x 3)	03

15. Internship

Twelve-month compulsory rotational postings during the internship which students have to work under the supervision of experienced staff in the following areas:

- ICU Dialysis
- Paediatric Dialysis
- Peritoneal Dialysis
- CRRT
- Plasmapheresis
- Haemodialysis
- Nephrology Procedure room
- Two Weeks Posting with Kidney transplant coordinator
- Two Week Posting in Emergency Department

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STUDENT LEARNING OUTCOMES ALLIED HEALTH SCIENCES PROGRAMMES

- Employ critical thinking and innovation to analyze challenges, concepts, research, and clinical outcomes and apply them to professional practice.

- Analyze, interpret, integrate and evaluate information with the ability to communicate findings in a written or oral format.

- Demonstrate a broad-based and integrative understanding of basic biological, physical, chemical, and/or psychological concepts that prepare them for careers in health science.

- Approach patient care from a cultural humility perspective that respects varied backgrounds including but not limited to: cultural, social, religious, racial, gender, and ethnic diversity of the patient and family regarding disease and their health.

- Integrate concepts from various scientific fields to meet the requirements for entry-level healthcare administrative positions or admission to professional programs in allied health fields (e.g. athletic training, physical therapy, occupational therapy, physician assistant, chiropractic, etc)

INTENDED LEARNING OUTCOMES- COMMON FOR ALL SPECIALITY

COURSE TITLE	OUTCOMES	ASSESSMENT METHODS V-Verbal W-Written P-Practical
Anatomy	1. Define basic technical terminology and language associated with anatomy 2. Identify the structures of human body 3. Describe the anatomy of human body 4. Describe the structure and features of the organ systems of the human body 5. Identify the anatomical structure in the dissected specimen	W,P,V Internal [20]+ university [80] Total marks=100
Physiology	1. Describe the functional anatomy and histology of various organ systems 2. Describe the basic physiological principles involved in the normal functioning of the human body 3. Apply the physiological principles in comprehending the pathophysiology of disease and its management	W,P,V Internal [20]+ university [80] Total marks=100
Biochemistry	1. Describe chemistry & metabolism of macromolecules, vitamins and minerals 2. Correlate biochemical mechanisms to diseases 3. Discuss the importance of biochemical parameters in clinical decision making	W,P,V Internal [20]+ university [80] Total marks=100 Practical
Microbiology	1. Classify microorganisms, discuss the morphological and growth characteristics and its association with causation of disease 2. Demonstrate and interpret basic laboratory techniques used in the detection of micro organisms 3. Explain principles of antimicrobial therapy and Immunization 4. Demonstrate basic infection control practices	W,P,V Internal [20]+ university [80] Total marks=100
Pathology	1. Identify and Describe the causative agent in various disease 2. Comprehend the major signs and symptoms of the various diseases 3. Describe the pathophysiology of various disease related to anesthetic care Apply pathophysiology 4. knowledge in anesthetic care 5. To Analyze the patient pre-operative fit for undergoing procedure	W,P,V Internal [20]+ university [80] Total marks=100

LEARNING OUTCOMES – RENALDIALYSIS TECHNOLOGY

COURSE TITLE		OUTCOMES	ASSESSMENT METHODS
Applied Anatomy &Physiology related to dialysis technology		1.Describe the development, structure and functional anatomy and physiology of the genitor urinary system. 2. Comprehend fundamentals of urology anatomy & physiology in patient assessment 3. Analyse patients with urology symptoms 4. Apply appropriate therapy to urology patients . 5.Demonstrate the knowledge of fundamentals of genito urinary anatomy and physiology and to use critical thinking	Internal [20] University [80] Total marks=100
Pharmacology related to Haemodialysis and Peritoneal Dialysis		1.Describe various drugs used in the field of urology .2.Comprehend Indications, contraindications, drug dosage, pharmacological action, adverse effects, etc. 3. Analyse the need for pharmacotherapy 4.Apply the knowledge of drugs and dosage 5. Demonstrate clinical skills in drug administration. 6.Awareness about radiation protection. 7.Pre preparation of uro radiological investigations. 8.Learn, to interpret the radiology films & reports related to urology.	Internal [20] University [80] Total marks=100
Concepts of renal disease: Clinical manifestation and its management		1.Describe the aetiopathogenesis of common urological diseases. 2. Differentiate the common urological diseases. 3.Explain the clinical diagnosis and management of urological disease. 4.Knowledge about urological abnormalities & management of the disease.	Internal [20] University [80] Total marks=100
Applied Sciences	Elective 1:Pathology	1..Demonstrate preparation of cytology smear and staining for body fluid, FNAC specimens	Internal [20] University [80] Total marks=100 P=80 IA=20 Total 100 Total W+P=200
	Elective II :Microbiology	1.Identify and Describe the causative agent in various disease 2.Comprehend the major signs and symptoms of the various diseases	
Basics of Renal Dialysis Technology		1.Get the knowledge about blood bank 2.Clinical aspect of urine analysis, semen analysis , renal function test . 3.Learn about the signs & symptoms of genitor urinary system & minor procedure	Internal [20] University [80] Total marks=100 P=80+ IA 20 Total W+P=200
Applied Dialysis Technology Paper I		1.Describe various instruments used in urology. 2.Apply the knowledge of handling instruments. 3.Assist in open & endourological procedures	Internal [20] University [80] Total marks=100 P=80+ IA 20 Total W+P=200
Applied Dialysis Technology Paper-II		1.Describe various electrodes used in ESWL machine. 2. Calibration of ESWL machine. 3.Apply the knowledge of urodynamic evaluation. 4.Techniques of doing urodynamics.	Internal [20] University [80] Total marks=100 P=80+ IA 20 Total W+P=200

FIRST YEAR B.SC RENAL DIALYSIS TECHNOLOGY

Paper 1: BASIC ANATOMY (INCLUDING HISTOLOGY)

No. of theory classes: 70 hours
No. of practical classes: 20 hours

1. Introduction:
Theory:

- Definition of anatomy and its divisions
- Terms of location, positions and planes
- Epithelium-definition, Classification, describe with examples, function
- Glands- classification, describe serous, mucous & mixed glands with examples
- Basic tissues – Classification with examples

Practical:

- Histology of types of epithelium
- Histology of serous, mucous & mixed salivary gland

2. Connective tissue:
Theory:

- Cartilage – types with example & histology Theory
- Bone – Classification, names of bone cells, parts of long bone, microscopy of compact
- bone, names of all bones, vertebral column, intervertebral disc, fontanelles of fetal skull
- Joints – Classification of joints with examples, synovial joint (in detail for radiology)
- Muscular system: Classification of muscular tissue & histology
- Names of muscles of the body

Practical:

- Histology of the 3 types of cartilage
- Histology of compact bone (TS & LS)
- Histology of skeletal (TS & LS) & cardiac muscle
- Demo of all bones showing parts, radiographs of normal bones & joints
- Demonstration of important muscles of the body

3. Cardiovascular system:
Theory:

- Heart-size, location, chambers, exterior & interior, pericardium
- Blood supply of heart
- Systemic & pulmonary circulation
- Branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery
- Inferior vena cava, portal vein, portosystemic 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

Practical:

- Demonstration of heart and vessels in the body
    - Histology of large artery & vein, medium sized artery & vein
    - Histology of lymph node, spleen, tonsil & thymus
    - Radiology: Normal chest radiograph showing heart shadows

4. Gastro-intestinal system

Theory:

- Parts of GIT: Oral cavity (lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Waldeyer's ring), Oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas, spleen, peritoneum & reflections

Practical:

- Demonstration of parts of GIT
- Radiographs of abdomen

5. Respiratory system

- Parts of RS: nose, nasal cavity, larynx, trachea, lungs, bronchopulmonary segments, diaphragm
- Histology of trachea, lung and pleura
- Names of paranasal air sinuses

Practical:

- Demonstration of parts of respiratory system.
- Normal radiographs of chest, X-ray paranasal sinuses
- Histology of lung and trachea

6. Urinary system

Theory:

- Kidney, ureter, urinary bladder, male and female urethra
- Histology of kidney, ureter and urinary bladder

Practical:

- Demonstration of parts of urinary system
- Histology of kidney, ureter, urinary bladder
- Radiographs of abdomen-IVP, retrograde cystogram

7. Reproductive system

Theory:

- 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

Practical:

- Demonstration of section of male and female pelvis with organs in situ
- Histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tubes, ovary
- Radiographs of pelvis – hysterosalpingogram

8. Endocrine glands

Theory:

- Names of all endocrine glands in detail on pituitary gland, thyroid gland& suprarenal gland – (gross & histology)

Practical:

- Demonstration of the glands

- Histology of pituitary, thyroid, parathyroid, suprarenal glands

9. Nervous system

Theory:

- Neuron & Classification of NS
- 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
- Sympathetic trunk & names of parasympathetic ganglia

Practical:

- Histology of peripheral nerve & optic nerve
- Demonstration of all plexuses and nerves in the body
- Demonstration of all part of brain
- Histology of cerebrum, cerebellum, spinal cord

10. Sensory organs

Theory:

- Skin: Skin-histology & Appendages of skin
- Eye: Parts of eye & lacrimal apparatus, Extra-ocular muscles & nerve supply
- Ear: parts of ear- external, middle and inner ear and contents

Practical:

- Histology of thin and thick skin
- Demonstration and histology of eyeball
- Histology of cornea & retina

11. Embryology:

Theory:

- Spermatogenesis & oogenesis
- Ovulation, fertilisation
- Fetal circulation
- Placenta

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20 Marks
Practicals: record and lab work* 10 Marks

*There shall be no university practical examination and internal assessment marks secured in Practicals need not be sent to the University.

Distribution of Marks for University Theory and Practical Exam

Theory			**Practicals**			**Total**
Theory	IA	Sub Total	Practicals	IA	Sub Total	
80	20	100	-	-	-	100

REFERENCE BOOKS:

1. William Davis (P) understanding Human Anatomy and Physiology – McGraw Hill
2. Chaursia- A Text Book of Anatomy
3. T. S. Ranganathan- A Text Book of Human Anatomy
4. Fattana, Human Anatomy (Description and applied)- Saunder's & C P Prism Publishers, Bangalore
5. ESTER. M. Grishcimer- Physiology & Anatomy with Practical Considerations, J. P. Lippin Cott. Philadelphia
6. Bhatnagar- Essentials of Human Embryology- Revised Edition. Orient Blackswan Pvt. Ltd

Paper 2: PHYSIOLOGY

No. of theory classes: 70 hours
No. of practical classes: 20 hours

1. General Physiology

- Introduction to cell physiology, transport across the cell membrane
- Homeostasis, Body Fluid compartment & measurement

2. Blood

- Introduction - composition and function of blood
- Plasma. proteins, types and functions
- Red blood cells - erythropoiesis, stages of differentiation, factors affecting it, function, normal count, physiological variation.
- Haemoglobin- function, concentration, types & methods of Hb estimation, fate of haemoglobin
- Jaundice-types Anaemia,-types
- ESR, PCV, osmotic fragility & blood indices
- WBC- morphology, production, functions, normal count, differential count, variation, variation Immunity (in brief)
- Platelets- origin, morphology, normal count, function-Platelet plug, bleeding disorder
- Haemostasis - definition, normal haemostasis, clotting factors, mechanism of clotting, anticoagulants disorders of clotting factors.

- Blood group-ABO & Rh system, Rh incompatibility blood typing ,cross matching, hazards of mismatched blood transfusion.
- RES, spleen and lymph

3. Nerve-Muscle

- Neuron structure, types, neuroglia-types, nerve fibre classification, properties of nerve fibres, RMP, action potential, Wallerian degeneration
- NMJ, blockers, Myasthenia gravis
- Classification of muscle, the structure of skeletal muscle, sarcomere, contractile proteins
- Excitation contraction coupling, mechanism of muscle contraction, types of contraction
- Motor unit, fatigue, rigour mortis Smooth muscle

4. Respiratory system

- Physiological anatomy of the respiratory system, muscles of respiration, respiratory & non-respiratory functions of lungs, dead space
- Mechanics of breathing, intrapulmonary & pleural pressures
- Compliance, Surfactant, Hyaline membrane disease
- Lung volumes and capacities
- Respiratory membrane , transport of O_2 & CO_2
- Chemical regulation of respiration
- Neural regulation of respiration
- Hypoxia, Acclamatization,
- Dysbarism. Artificial respiration
- Definition-Periodic breathing ,dyspnoea, apnoea, asphyxia,, cyanosis

5. Cardiovascular system

Introduction to CVS & general principles of circulation

- Properties of Cardiac muscle
- Cardiac cycle, heart sounds, Pulse
- Cardiac output, factors and measurement
- Heart rate
- BP-factors, measurement, Short term regulation
- Intermediate and long term regulation of BP
- ECG uses and significance, .normal waveform, heart block
- Coronary circulation, Cutaneous circulation-Triple response
- Shock
- Effects of exercise on CVS and Respiratory system

6. Renal system, Skin and body temperature

- Kidneys- functions, structure of nephron, type, juxtaglomerular apparatus-structure and function, non-excretory functions of kidney
- Glomerular filtration rate (GFR)- Definition ,normal value, factors affecting GFR
- Tubular reabsorption - sites, substance reabsorbed, mechanisms of reabsorption
- Tubular secretion- sites, substance secreted, mechanisms of reabsorption
- Counter current mechanism of concentration of urine
- Obligatory and Facultative reabsorption of water
- Micturition reflex, Diuretics
- Artificial kidney, renal function tests-clearance tests
- Skin -structure and function, body temperature measurement, physiological variation,
- Regulation of body Temperature by physical chemical and nervous mechanisms-Role of Hypothalamus
- Hypothermia and fever

7. Digestive system

- Physiological anatomy, Enteric nervous system & functions of GIT
- Saliva- composition, regulation,disorder.
- Deglutition- stages & disorders
- Stomach-functions, composition and regulation of gastric juice
- Gastric motility, MMC, vomiting reflex.
- Pancreas- function, composition and regulation of pancreatic juice
- Liver & gall bladder-functions, bile- composition, secretion and regulation
- Small intestine- Succus entericus-composition, functions & movements
- Large intestine- functions, movements and defecation reflex
- Digestion & absorption of Carbohydrates, fats and proteins

8. Endocrine system

- Classification of Endocrine glands & their hormones & properties-chemistry and receptor, feedback mechanisms of hormone regulation.
- Anterior pituitary hormones- secretion, functions , disorders
- Posterior pituitary hormones- secretion , functions , disorders
- Thyroid hormones- secretion, functions, disorders
- Parathyroid hormones- secretion, functions, disorders
- Calcium homeostasis & disorders
- Pancreatic hormones, -Insulin and Glucagon- . secretion, functions, disorders
- Adrenal cortex- Glucocorticoids & Mineralocorticoids, Androgen - secretion, functions, disorders
- Adrenal medulla- secretion, functions, disorders Thymus & Pineal gland

9. Reproductive system

- Introduction to reproductive system, sex differentiation & Puberty
- Male reproductive system, functions of testosterone & Spermatogenesis
- Female reproductive system, functions of Estrogen, Progesterone, Oogenesis
- Ovulation & Menstrual cycle
- Physiological changes during pregnancy, pregnancy tests, parturition & lactation
- Male & Female contraceptive methods

10. Central nervous system

- Introduction to CNS, Sensory receptors classification, properties
- Synapse– classification, properties
- Sensory pathways: Anterior spino thalamic tract and Posterior column pathway
- Lateral spino thalamic tract, Types of pain, Referred pain, Thalamus; nuclei and function
- Classification of reflexes, Monosynaptic reflex- Stretch reflex , muscle spindle ,inverse stretch reflex. Polysynaptic reflex-Withdrawal reflex
- Motor pathways : Pyramidal pathway and functions, UMNL, LMNL
- Cerebral cortex (Sensory and motor)-functions, Medulla and Pons-functions
- Cerebellum –functions, disorders
- Basal ganglia-functions, disorders
- Hypothalamus and Limbic system-functions
- CSF, lumbar puncture
- Sleep, EEG,
- Autonomic Nervous System - Sympathetic and parasympathetic distribution and functions

11. Special senses

- Vision –Functional anatomy of eye, visual pathway, lesion
- Refractive errors, color vision

- Audition – Physiological anatomy of E
- ar, Mechanism of hearing, auditory pathway, deafness
- Olfaction –modalities, receptor, function, abnormalities
- Gustation-modalities, receptor, function, taste pathway, abnormalities

Practicals

Blood pressure Recording
Auscultation for Heart Sounds
Artificial Respiration
Determination of vital capacity

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20 Marks
Practicals: record and lab work* 10 Marks

*There shall be no university practical examination and internal assessment marks secured in Practicals need not be sent to the University.

Distribution of Marks for University Theory and Practical Exam

Theory			**Practicals**			**Total**
Theory	IA	Sub Total	Practicals	IA	Sub Total	
80	20	100	-	-	-	100

Reference Books:

Guyton (Arthur) Text Book of Physiology. Latest Ed. Prism Publishers

Chatterjee (CC) Human Physiology Latest Ed. Vol. 1, Medical Allied Agency

Choudhari (Sujith K) Concise Medical Physiology Latest Ed. New Central

Book Ganong (William F) Review of Medical Physiology. Latest Ed.

Paper 3: BIOCHEMISTRY

No. Theory classes: 70 hours

No. of practical classes: 20 hours

1. **Carbohydrate Chemistry [3 hours]**
   - Classification (Definition/ examples for each class)
   - Monosaccharides (classification depending upon number of carbon atoms and functional group with examples)
   - Disaccharides (Sucrose/ lactose/ maltose and their composition)
   - Polysaccharides :
     a) Homopolysaccharides (Structure of starch and glycogen)
     b) Heteropolysaccharides (Functions)

2. **Lipid Chemistry [3 hours]**
   - Definition of lipids
   - Functions of lipids in the body
   - Classification of lipids (subclasses with examples)
   - Definition and Classification of fatty acids
   - Essential fatty acids
   - Phospholipids and their importance

3. **Amino-acid and Protein Chemistry [3 hours]**
   - General structure of D and L amino acids
   - Amino acids; Definition and Classification of amino acids with examples.
   - Peptides; definition & Biologically important peptides
   - Classification of Proteins based on composition, functions and shape (with examples)
   - Functions of amino acids and Proteins

4. **Nucleotide and Nucleic acid Chemistry [3 hours]**
   - Nucleosides & Nucleotides
   - Nucleic acid Definition & types
   - Composition & functions of DNA & RNA
   - Structure of DNA (Watson and Crick model)
   - Structure of tRNA, & functions of tRNA, rRNA, mRNA
   - Difference between DNA and RNA

5. **Enzymes [5 hours]**
   - Definition & Classification of Enzymes with example
   - Definitions of Active site, Cofactor (Coenzyme, Activator),
   - Proenzyme; Definition and examples (Pepsin & trypsin)

6. **Digestion and Absorption [3 Hours]**
   - General characteristics of digestion and absorption,
   - Digestion and absorption of carbohydrates, proteins and lipids.

7. **Carbohydrate Metabolism [5 Hours]**
   - Glycolysis ; Aerobic, Anaerobic, Definition , Site and subcellular site , Steps with all the enzymes and coenzymes at each step , mention the regulatory enzymes , Energetics,
   - Citric acid cycle; Pyruvate dehydrogenase complex (reaction and coenzymes) , Site and

subcellular site , Reactions with all the enzymes and coenzymes ,Regulatory enzymes , Energetics

- Significance of HMP Shunt pathway.
- Hyperglycemic and hypoglycemic hormones
- Blood Glucose Regulation.
- Diabetes mellitus (definition, Classification, signs and symptoms)
- **Glycogen metabolism and gluconeogenesis**

8. Lipid Metabolism [4 Hours]

- Introduction to lipid metabolism, Lipolysis
- Beta oxidation of fatty acids ; Definition,Site and subcellular site, Activation of palmitic acid , Transport of activated palmitic acid into mitochondria , Reactions , Energetics
- Name the different ketone bodies. Note on ketosis

9. Amino acid and Protein Metabolism [3 Hours]

- Introduction, transamination, deamination, Fate of ammonia, transport of ammonia,
- Urea cycle.

10. Vitamins [5 Hours]

- Definition and Classification.
- RDA, sources, coenzyme forms, biochemical functions and disorders for the following water soluble vitamins: Thiamine, Niacin, Pyridoxine, Cobalamine, Folic acid, Ascorbic acid
- RDA, sources, coenzyme forms, biochemical functions and deficiency disorders for the following fat soluble vitamins; A and vitamin D

11. Mineral Metabolism [3 Hours]

- Name the macro/ microminerals
- Iron: Sources ,RDA, Functions and Disorders of deficiency and excess
- Calcium and phosphorus: Sources ,RDA, functions, normal serum levels and hormones reulating their levels

12. Nutrition [6 hours]

- Balanced diet (Definition)
- Caloric value ; Definition , Caloric values of carbohydrates, proteins and fats
- Total daily caloric requirements of an adult male and female,
- RDA (Definition, standard values for nutrients)
- Basal metabolic rate(BMR) ; Definition , Magnitude of BMR in men and women, Factors affecting BMR
- Thermic effect/ SDA of food (Definition, values for major macronutrients)
- **Carbohydrates** ;. Daily dietary requirement. 2. Dietary fibers (Definition, functions, importance and their daily requirements)
- **Proteins ;.** Daily requirement, Biological value. a. Definition b. Protein used as a standard for this, Protein sources with high and low biological value , Mutual supplementation of proteins (Definition, examples)
- **Fats** ; Daily requirement , Essential fatty acids (Definition, functions, daily requirement and deficiency manifestations) , Saturated and unsaturated fatty acids (Definition,

sources, examples)

- **Malnutrition**

13. Renal Function Tests [2 hours]

- Name the different tests to assess the kidney functions
- Explain Creatinine clearance & Inulin clearance
- Urinary acidification test

14. Radioactive Isotopes [1 hour]

- Definition, clinical applications
- Biological effects of radiations

15. Clinical Biochemistry [5 hours]

A. Definitions of acid, base, pH and pKa [1 hour]

B. Buffers • Definition [2 hours]

- Henderson Hasselbalch equation,
- Principal buffer systems in the ECF ICF and urine
- Bicarbonate and phosphate buffer systems (pKa value, normal ratio of base/acid in the plasma)
- Acidosis & Alkalosis (Definition, Classification, causes and biochemical findings

C. Normal serum levels and condition where they are altered [2 hour]

- Glucose, Protein, urea, uric acid, and creatinine
- Bilirubin, cholesterol
- Serum Electrolytes

16. Fundamental Chemistry (1 hour)

- Valency, Molecular weight & Equivalent weight of elements and compounds. Normality, Molarity, Molality.

17. Solutions: Definition, use, Classification where appropriate, preparation and storage (5 hours)

- Stock and working solutions.
- Molar and Normal solutions of compounds and acids. (NaCl, NaOH, HCl, H_2SO_4, H_3PO_4, CH_3COOH etc.,)
- Preparation of percent solutions – w/w, v/v w/v (solids, liquids and acids), Conversion of a percent solution into a molar solution
- Saturated and supersaturated solutions
- Standard solutions. Technique for preparation of standard solutions and storage. E.g: glucose, albumin etc.
- Dilutions- Diluting Normal , Molar and per cent solutions. Preparing working standard from stock standard.
- Part dilutions: Specimen dilutions. Serial dilutions. Reagent dilution. Dilution factors

ASSIGNMENT TOPICS

1. Units of measurement
2. Hazards - Physical, Chemical, Biological
3. Arterial blood gas analysis
4. Responsibilities of Health care personnel
5. Biomedical waste management

PRACTICAL DEMONSTRATION [20 hours]

- Colour Reactions of Carbohydrates & amino acids.
- Precipitation Reactions of proteins
- Colourimetry
- Estimation of Blood glucose Folin Wu and enzymatic method
- Estimation of Urea by DAM method

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20 marks
Practicals: record and lab work* 10 marks

*There shall be no university practical examination and internal assessment marks secured in Practicals need not be sent to the University.

Distribution of Marks for University Theory and Practical Exam

Theory			**Practicals**			**Total**
Theory	IA	Sub Total	Practicals	IA	Sub Total	
80	20	100	-	-	-	100

Text Book References

- Biochemistry – 3rd revised Edition by U Sathyanarayana & U Chakrapani
- Textbook of Medical Biochemistry-6th Edition by MN Chatterjea & Rana Shinde
- Textbook of Medical Laboratory technology 2nd edition by Godkar and Godkar.
- Biochemistry-3rd edition by Pankaja Naik
- Medical Laboratory technology 6th edition by Ramnik Sood.
- Manipal Manual of Clinical Biochemistry for medical laboratory and M.Sc., students-3rd edition by Shivananda Nayak B
- Varley's Practical Clinical Biochemistry, 4th, 5th and 6 th editions

Paper 4: PATHOLOGY: Clinical Pathology, Hematology and Blood Banking

Theory-70 hours
Practicals-20 hours

I. Clinical Pathology- Theory

- Introduction to clinical pathology
- Collection, transport, preservation and processing of various clinical specimens
- Urine examination- collection and preservation, Physical, chemical and microscopic examination for abnormal constituents
- Examination of Body fluids
- Examination of Cerebrospinal fluid (CSF)
- Sputum examination
- Examination of faeces

II. Hematology – Theory

- Introduction to hematology
- Normal constituents of Blood, their structure and functions
- Collection of Blood samples
- Various anticoagulants used in Hematology
- Hemoglobin estimation, different methods and normal values
- Packed cell volume
- Erythrocyte sedimentation rate
- Normal Haemostasis
- Bleeding time. Clotting time, prothrombin time, Activated partial Thromboplastin time

III. Blood Bank- Theory

- Introduction blood banking
- Blood group system
- Collection and processing of blood for transfusion
- Compatibility testing
- Blood transfusion reactions

VI. General Pathology:

1. Cell injury:

a. Definition, causes.
b. Cellular adaptations – Hypertrophy, hyperplasia, atrophy and metaplasia.
c. Types of cell injury – Reversible and irreversible; morphology of reversible injury.
d. Necrosis – Definition and patterns of tissue necrosis.
e. Intracellular accumulations – Lipids, cholesterol, proteins, glycogen and pigments; examples.
f. Pathologic calcification – Types and examples.

2. Inflammation:

g. Definition and signs of inflammation.
h. Types – Acute and chronic inflammation.

i. Acute inflammation – Causes, morphological patterns and outcome.
j. Chronic inflammation – Causes, morphology and examples.
k. Regeneration and repair – Mechanism of cutaneous wound healing.
l. Factors affecting wound healing.

3. Hemodynamic disorders:

m. Edema – Definition, pathogenesis and types: Renal, cardiac, pulmonary and cerebral.
n. Difference between transudate and exudate.
o. Shock – Definition, types of shock with examples: Hypovolemic, cardiogenic and septic shock, stages of shock: Nonprogressive, progressive and irreversible.
p. Thrombosis – Definition, mechanism of thrombus formation (Virchow's triad) and fate of thrombus.
q. Embolism – Definition and types: Thromboembolism, fat, air and amniotic fluid embolism.
r. Infarction – Definition and examples.

4. Immune system:

s. Autoimmune diseases – General features, enumerate systemic and organ specific autoimmune diseases.
t. Systemic lupus erythematosus – Manifestations and diagnosis.

5. Neoplasia:

u. Definition and nomenclature of tumors.
v. Differences between benign and malignant neoplasms.
w. Enumerate modes of carcinogenesis: Genes, physical, chemical and microbial agents of carcinogenesis.
x. Modes of spread of tumors.
y. Clinical aspects of neoplasia.
z. Grading and staging of cancers.
aa. Laboratory diagnosis of cancer.

Practicals

1. Urine analysis- Physical, Chemical, Microscopic
2. Blood grouping and Rh typing
3. Hb estimation , packed cell volume (PCV), Erythrocyte Sedimentation rate (ESR)
4. Bleeding time and Clotting time

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20 Marks
Practicals: record and lab work* 10 Marks

Distribution of Marks for University Theory and Practical Exam

Theory			Practicals			Total
Theory	IA	Sub Total	Practicals	IA	Sub Total	
80	20	100	-	-	-	100

REFERENCE BOOKS:

1. Culling Histopathology techniques
2. Bancroft Histopathology techniques
3. Koss- Cytology 4. Winifred Diagnostic cytopathology
5. Orell Cytopathology
6. Todd and Sanford- clinical diagnosis by Laboratory Medicine
7. Dacie and Lewis- Practical Hematology
8. Ramnik SOOD. Lab technology, Methods and interpretation, 4 th edition JP Bros New Delhi, 1996
9. Sathish Guptha , Short text book of Medical laboratory techniques for technicians
10. Sachdev K N. Clinical Pathology and Bacteriology, 8 th edi JP Bros, New Delhi, 1996

Microbiology I

Theory: 70 Hours
Practicals: 20 Hours

1. Introduction (6 hrs)

History of Microbiology - Louis Pasteur, Antony Van Leeuvenhoek, Robert Koch, Edward Jenner, Alexander Fleming.
Use of microscope in the study of bacteria - Types of microscopes - compound microscope, phase contrast microscope, electron microscope, fluorescent microscope, dark ground microscope.
Morphology of bacterial cell

2. Growth and Nutrition (6 hrs.)

Nutrition, growth and multiplication of bacteria, bacterial growth curve, culture media, culture methods, anaerobic culture methods.

3. Sterilization and disinfection (8 hrs.)

Principles and use of equipments of sterilization, chemicals used in disinfection, testing of disinfectants.

4. Biomedical waste management principle and practice

5. Immunology (5hrs.)

Immunity - mechanism of immunity, classification, types
Vaccines
Immunization schedule
Definition of antigen, antibody, list of antigen antibody reaction (no need of detailed account of antigen antibody reactions)
Definition of hypersensitivity and classification (no need of detailed account of types of hypersensitivity)

6. Infection (5 hrs.)

Definition, types and mode of transmission
Hospital acquired infection - causative agents, mode of transmission and prophylaxis.
Antimicrobial sensitivity testing

7. Systematic bacteriology (15 hrs.)

Disease caused and laboratory diagnosis of medically important bacteria (Staphylococcus, coagulase negative Staphylococcus, MRSA, Streptococcus pyogenes, Pneumococcus, gonococcus, E.coli, diarrhoeagenic E.coli, Salmonella, Vibrio cholerae, ElTor vibrios, Halophilic vibrios, Shigella, Mycobacterium tuberculosis, Mycobacterium leprae, Atypical Mycobacteria, Treponema pallidum, leptospira)
(no need of classification, antigenic structure, virulence mechanism)

8. Parasitology (10 hrs.)

Introduction to Parasitology
List of medically important parasites and diseases (E.histolytica, Plasmodium, W.bancrofti, Ascaris, Ancylostoma, B.coli, G.lamblia, T.solium, T.saginata)
Laboratory diagnosis of parasitic infection (No need of including life cycles)

9. Virology (10 hrs.)

Introduction to virology
List of medically important viruses and diseases (AIDS, Hepatitis, Rabies, Polio, Arbo viruses)
Cultivation of viruses and laboratory diagnosis of viral infections

10. Mycology (5 hrs.)

Introduction to Mycology
Classification of medically important fungi - (based on morphology, spore production, disease production, taxonomy)
List of medically important fungi and diseases (Candidiasis, Cryptococcosis, Dermatophytes, Aspergillosis, Mucor Mycosis)
Laboratory diagnosis of fungal infections.

Practicals (20 hrs.)

Compound microscope (Demonstration)
Demonstration of sterilization equipments
Demonstration of culture media and culture methods
Demonstration of antibiotic sensitivity testing
Demonstration of serological tests - Widal, VDRL, ASO, CRP, RA
Demonstration of gram stain and ZN staining
Demonstration of Helminthic ova
Grams stain, Acid fast staining
Stool exam for Helminthic ova

There shall be no university practical examination and Internal Assessment marks secured in practicals need not be sent to the university.

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20 marks

Practicals: record and lab work* 10 marks

*There shall be no university practical examination and internal assessment marks secured in Practicals need not be sent to the University.

Distribution of Marks for University Theory and Practical Exam

Theory			**Practicals**			**Total**
Theory	IA	Sub Total	Practicals	IA	Sub Total	
80	20	100	-	-	-	100

Reference Books-

1. Ananthanarayana & Panikar Medical Microbiology- University Press
2. Robert Cruckshank- Medical Microbiology- The Practice of Medical Microbiology
3. Chatterjee- Parasitology- Interpretation to Clinical Medicine
4. Rippon- Medical Mycology
5. Emmons- Medical Mycology
6. Basic Laboratory methods in Parasitology, J P Bros, New Delhi
7. Basic Laboratory procedures in clinical bacteriology, J P Bros, New Delhi
8. Medical Parasitology- Ajit Damle
9. Introduction to medical microbiology- Ananthanarayana- Orient Longman Pvt. Ltd

SUBSIDIARY SUBJECTS

ENGLISH

COURSE OUTLINE

COURSE DESCRIPTION: This course is designed to help the student acquire a good command and comprehension of the English language through individual papers and conferences.

BEHAVIOURAL OBJECTIVES:

The student at the end of training is able to

1. Read and comprehend English language
2. Speak and write grammatically correct English
3. Appreciates the value of English literature in personal and professional life.

UNIT - I: INTRODUCTION:

Study Techniques

Organisation of effective note taking and logical processes of analysis and synthesis

Use of the dictionary

Enlargement of vocabulary

Effective diction

UNIT - II: APPLIED GRAMMAR:

Correct usage

The structure of sentences

The structure of paragraphs

Enlargements of Vocabulary

UNIT - III: WRITTEN COMPOSITION:

Precise writing and summarising

Writing of bibliography

Enlargement of Vocabulary

UNIT - IV: READING AND COMPREHENSION:

Review of selected materials and express oneself in one's words.

Enlargement of Vocabulary.

UNIT - V: THE STUDY OF THE VARIOUS FORMS OF COMPOSITION:

Paragraph, Essay, Letter, Summary, Practice in writing

UNIT - VI: VERBAL COMMUNICATION:

Discussions and summarisation, Debates, Oral reports, use in teaching

Scheme of Examination

Written (Theory): Maximum Marks: –80 marks.

No Practical or Viva voce examination

REFERENCE

1. English Grammar Collins, Birmingham University, International Language Data Base, Rupa & Co. 1993

2. Wren and Martin - Grammar and Composition, 1989, Chanda & Co, Delhi

3. Letters for all Occasions. A S Myers. Pub - Harper Perennial

4. Spoken English V. Shasikumar and P V Dhanija. Pub. By: Tata Mcgraw Hill, New Delhi

5. Journalism Made Simple D Wainwright

6. Writers Basic Bookself Series, Writers Digest series

7. Interviewing by Joan Clayton Platkon

8. Penguin Book of Interviews.

No Practical or Viva voce examination

This is a subsidiary subject, examination to be conducted by respective colleges. Marks required for a pass is 35%.

HEALTH CARE

Teaching Hours : 40

Introduction to Health

Definition of Health, Determinants of Health, Health Indicators of India, Health Team Concept. National Health Policy

National Health Programmes (Briefly Objectives and scope) Population of India and Family welfare programme in India Introduction to Nursing

What is Nursing? Nursing principles. Inter-Personnel relationships. Bandaging: Basic turns; Bandaging extremities; Triangular Bandages and their application. Nursing Position, Bed making, prone, lateral, dorsal, dorsal re-cumbent, Fowler's positions, comfort measures, Aids and rest and sleep.

Lifting And Transporting Patients: Lifting patients in the bed. Transferring from bed to wheelchair. Transferring from bed to stretcher.
Bed Side Management: Giving and taking Bedpan, Urinal: Observation of stools, urine.

Observation of sputum, Understand the use and care of catheters, enema giving. Methods of Giving Nourishment: Feeding, Tube feeding, drips, transfusion Care of Rubber Goods

Recording of body temperature, respiration and pulse, Simple aseptic technique, sterilisation and disinfection.
Surgical Dressing: Observation of dressing procedures

First Aid :
Syllabus as for Certificate Course of Red Cross Society of St. John's Ambulance Brigade.

Reference Books:

Preventive and Social Medicine by J.Park

Text Book of P & SM by Park and Park

Counseling & Communicate skills for medical and health, Bayne- Orient Longman Pvt. Ltd.

No Practical or Viva voce examination

This is a subsidiary subject, examination to be conducted by respective colleges. Marks required for pass is 35%. SECOND YEAR B.SC RENAL DIALYSIS TECHNOLOGY

Paper 1: APPLIED ANATOMY AND PHYSIOLOGY RELATED TO DIALYSIS TECHNOLOGY

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
6. Concept of Abdominal Hernias
7. Anatomy of Vascular System
8. Upper Limb Vessels- Course, Distribution, Branches, Origin& Abnormalities
9. Neck Vessels- Course, Distribution, Branches, Origin& Abnormalities
10. Femoral Vessels- Course, Distribution, Branches, Origin& Abnormalities

PHYSIOLOGY

1. Mechanism Of Urine Formation
2. Glomerular Filtration Rate (GFR)
3. Clearance Studies
4. **Physiological Values** - Urea, Creatinine, Electrolytes, Calcium, Phosphorous, Uric Acid, Magnesium, **Glucose 24 Hours Urinary Indices** - Urea, Creatinine, Electrolytes, Calcium, Magnesium
5. Physiology Of Renal Circulation
6. Factors Contributing to & Modifying Renal Circulation
7. Auto-regulation
8. Hormones Produced By Kidney & Physiologic Alterations In Pregnancy
9. **Haemostasis** - Coagulation Cascade, Coagulation Factors, Auto Regulation, Bleeding time(BT), Clotting time(CT), PT, PTT, Thrombin Time
10. **Acid-Base Balance** - Basic Principles & Common Abnormalities Like Hypokalemia, Hyponatremia, Hyperkalemia, Hypernatremia, Hypocalcemia, Hypercalcemia, pH, Etc.

Distribution of Marks for University Theory and Practical Exam

Theory			Practical			Total
Theory	IA	Total	Practicals	IA	Total	
80	20	100	-	-	-	100

Reference Books:

1. William Davis (P) understanding Human Anatomy and Physiology – McGraw Hill
2. Chaursia- A Text Book of Anatomy
3. T. S. Ranganathan- A Text Book of Human Anatomy
4. Fattana, Human Anatomy (Description and applied)- Saunder's & C P Prism Publishers, Bangalore
5. ESTER. M. Grishcimer- Physiology & Anatomy with Practical Considerations, J. P. Lippin Cott. Philadelphia
6. Bhatnagar- Essentials of Human Embryology- Revised Edition. Orient Blackswan Pvt. Ltd

Paper 2: PHARMACOLOGY RELATED TO HAEMODIALYSIS AND PERITONEAL DIALYSIS

1. **Diuretics**-classification, action, dosage, side effects and contraindications
2. **Antihypertensive drugs**: Classification, action, dosage, side effects and contraindications
3. **Vasopressors and inotropes** - Classification, action, dosage, side effects and contraindications
4. **Colloids and crystalloids**: - Classification, action, dosage, side effects and contraindications
5. **Erythropoietin** - classification, action, dosage, side effects and contraindications
6. Phosphate binders, calcium supplements, folic acid & other vitamin supplements used for patients on Dialysis.
7. **Iron supplementation** injections and tablets - Classification, action, dosage, side effects and contraindications
8. **Anticoagulant** - Classification, action, dosage, side effects and contraindications

9. **Protamine sulphate**: dose indication and side effects
10. **Antibiotics** used in dialysis patients to treat catheter infections and peritonitis
11. **Vaccines** used in dialysis patients; dose and frequency
12. **Peritoneal dialysis solutions**-composition and different types of fluids
13. **Immunosuppressive drugs**
14. **Haemodialysis solutions –** composition and dilution ratios
15. Continuous Renal Replacement Therapy (CRRT) solutions and citrate coagulation

Distribution of Marks for University Theory and Practical Exam

Theory			**Practical**			**Total**
Theory	IA	Total	Practicals	IA	Total	
80	20	100	-	-	-	100

Reference books:
Essentials of Medical Pharmacology - Tripathi
Basics and Clinical Pharmacology - Katzung

PAPER 3: CONCEPTS OF RENAL DISEASES: CLINICAL MANIFESTATIONS EVALUATION & MANAGEMENT

1. Acute renal failure
2. Nephrotic syndrome - primary & secondary
3. Nephritic syndrome
4. UTI- urinary tract infections
5. Asymptomatic urinary abnormalities
6. Chronic renal failure causes, stages, diagnosis and management

7. Renal stone diseases
8. Obstructive uropathies
9. Congenital & inherited renal diseases
10. Tumours of kidney
11. Pregnancy-associated renal diseases
12. Renal vascular disorders &hypertension associated renal diseases
13. Renal replacements therapies
14. Renal nutrition –Pre Dialysis stage (Stage 1-4), Haemodialysis, Peritoneal Dialysis and post transplant

Distribution of Marks for University Theory and Practical Exam

Theory			Practical			Total
Theory	IA	Total	Practicals	IA	Total	
80	20	100	-	-	-	100

Reference books:

1. Brenner & Rector's the Kidney: Karl Skorecki, Glenn M. Chertow, Philip A. Marsden
2. Diagnostic Pathology: Kidney Diseases E-Book: By Matthew R Lindberg, Anthony Chang

PAPER 4: APPLIED ASPECTS OF PATHOLOGY & MICROBIOLOGY

Pathology

1. Congenital abnormalities of the urinary system
2. Classification of renal diseases
3. Glomerular diseases- causes, types & pathology
4. Tubule interstitial diseases

5. Renal vascular disorders
6. End-stage renal diseases- causes & pathology
7. Pathology of kidney in hypertension, diabetes mellitus, pregnancy
8. Pathology of peritoneum- peritonitis- bacterial, tubular& sclerosing peritonitis

   Dialysis induced changes
9. Pathology of urinary tract infections
10. Pyelonephritis & tuberculous pyelonephritis

Microbiology

1. Hepatotrophic viruses in the detail- mode of transfusion, universal precautions, vaccinations
2. Human immune deficiency virus (HIV), mode of transfusion, universal precautions
3. Opportunistic infections
4. Microbiology of urinary tract infections
5. Microbiology of vascular access infection (femoral, jugular and subclavian)
6. Sampling methods for culture & sensitivity

Practicals

1. Staining technique (performance)
   - Gram stain
   - ZN stain
2. Demonstration of culture media and culture methods
3. Demonstration of antibiotic sensitivity testing
4. Demonstration of sterilisation equipment

SCHEME OF EXAMINATION – PRACTICALS

The scheme of examination for **APPLIED ASPECTS OF PATHOLOGY & MICROBIOLOGY** Practical shall be as follows:

Distribution of marks

Type of question	Marks allotted
Spotters	20
Practical Based on Pathology and Microbiology	20
Viva	20
Record	20
Total	**80**

Distribution of Marks for University Theory and Practical Exam

Theory			Practical			Total
Theory	IA	Total	Practicals	IA	Total	
80	20	100	80	20	100	200

Reference Books-

1. Ananthanarayana & Panikar Medical Microbiology- University Press
2. Robert Cruckshank- Medical Microbiology- The Practice of Medical Microbiology
3. Chatterjee- Parasitology- Interpretation to Clinical Medicine
4. Rippon- Medical Mycology
5. Emmons- Medical Mycology
6. Basic Laboratory methods in Parasitology, J P Bros, New Delhi
7. Basic Laboratory procedures in clinical bacteriology, J P Bros, New Delhi
8. Medical Parasitology- Ajit Damle
9. Introduction to medical microbiology- Ananthanarayana- Orient Longman Pvt. Ltd
10. Basic Pathology: An introduction to the mechanisms of disease :Sunil R Lakhani, Susan A

Paper 5: BASICS OF RENAL DIALYSIS TECHNOLOGY

1. Checking vitals- Blood pressure, Heart rate, Respiratory rate and temperature
2. Basic science related to Dialysis
3. Indications for Dialysis
4. Types of Dialysis
5. Vascular access
6. Dialyser-types, membrane, surface area, clearance and Kuf
7. Dialysis solutions compositions
8. Pre haemodialysis assessments
9. Monitoring during Dialysis
10. Post dialysis assessments
11. Complications during Dialysis

12. Haemodialysis machines preparation and settings
13. Haemodialysis machine alarms during Dialysis and troubleshooting
14. Anticoagulation
15. Dialyser reuse
16. Water treatment system – basics
17. Peritoneal Dialysis- Physiology of Peritoneal Dialysis and apparatus for peritoneal Dialysis
18. BCLS and Crash-cart management
19. Equipment used in Dialysis and its monitoring and safety check: Hemodialysis machine, Dialyser Reprocessor, CRRT machines, Cardiac monitors, Defibrillator, ECG machines, BP apparatus, USG machines, Acid Bicarbonate mixing system, Water treatment system.
20. Infection control practices and universal precautions
    - Hand wash
    - Waste management
    - Needlestick management and prevention
    - Personal protective equipment and appropriate usage
    - Cleaning and disinfection of dialysis machines
    - Managing patients with HIV HBsAg and HCV
    - Vascular access- infection prevention
    - Blood spill management.
    - Hazardous material storage and spill management

Practicals :

- Pre –Dialysis and post Dialysis assessments
- Dialysis machine connection and disconnection
- Monitoring during Dialysis
- Checking blood pressure, temperature and heart rate
- Priming blood system
- Reuse of dialysers
- Assisting haemodialysis
- water treatment system monitoring
- Preparation of dialysis solution.
- Demonstrate Hand wash techniques
- Peritoneal dialysis apparatus

Distribution of Marks for University Theory and Practical Exam

Theory			**Practical**			**Total**
Theory	IA	Total	Practicals	IA	Total	
80	20	100	80	20	100	200

SCHEME OF EXAMINATION – PRACTICALS

The scheme of examination for the "**BASICS OF DIALYSIS TECHNOLOGY"** Practical shall be as follows

Distribution of marks:

Type of question	Marks allotted
Spotters	20
Practical Based on Basics of dialysis technology	30
Viva	20
Record	10
Total	80

Reference Books:

1. Handbook of Dialysis – 5th Edition – John T Daugirdass
2. Handbook of dialysis therapy – Allen R Nissenson
3. Core curriculum for dialysis technician 6th edition
4. KDOQI guidelines.
5. Dialysis Water and Dialysate Recommendations: AAMI

Subsidiary subjects

1. **Nutrition**

- Introduction to the science of nutrition
  - Definition
  - Food pattern and its relation to health
  - Factors influencing food habits, selection and foodstuffs
  - Superstitions, culture, religion, income, the composition of family, age, occupation,
- special group
  - Food selection, storage & preservation
  - Prevention of blood adulteration
- Classification of nutrients
  - Macronutrients and micronutrients
  - Proteins- types, sources, requirements and deficiencies of proteins
  - Carbohydrates sources, requirements & deficiency
  - Fats- types, sources, requirements and deficiency of fats
  - Water- sources of drinking water, requirements, preservation of water
  - Minerals - types, sources, requirements deficiencies of minerals
  - Vitamins - types, sources, requirements deficiencies of vitamins
  - Planning diets

- Need for planning diets

  - Concept of a balanced diet
  - Food group & a balanced diet
  - Influence of age, sex, occupation & physiological state
  - Recommended dietary intake in planning diet
  - Steps in planning a balanced diet
  - Planning renal diet
  - Purpose and methods of cooking
  - Effects of heat on the cooking of foods
  - Preparation of basic recipes - clear fluids
  - Full fluids, vegetable preparation, egg recipes, fish and meat recipes, light puddings

Scheme of Examination

Written (Theory): Maximum Marks: –80 marks.

No Practical or Viva-voce examination

This is a subsidiary subject, examination to be conducted by respective colleges. Marks required for a pass is 35 marks.

THIRD YEAR B.Sc RENAL DIALYSIS TECHNOLOGY

PAPER 1: APPLIED DIALYSIS TECHNOLOGY PAPER I

1. Chronic Renal Failure and Acute Renal Failure causes, stages and management. Indications for Dialysis
2. Choice of renal replacement therapy (RRT) modality
3. History & types of Dialysis
4. Theory of haemodialysis - diffusion, osmosis, ultrafiltration & solvent drag
5. Vascular access for haemodialysis
   A. Arteriovenous fistula
      - Types of vascular access
        - Vessel preservation
        - Preoperative evaluation
        - Physical examination
          - Imaging studies
          - Allen Test
          - Venography
      - Possible locations for upper extremity AV fistulas
      - Perioperative care and fistula maturation
        - Rule of sixes
        - Details of fistula maturation
      - Initial trial cannulation of a new AV fistula
      - Initial cannulation procedure

   B. Arteriovenous grafts
      - Potential AV graft locations
        - Common locations
        - Uncommon locations
      - Postoperative care
      - Maturation
      - Physical examination of AV fistulas and grafts

- Inspection
- Palpation and auscultation
  - Pulse
  - Thrill
  - Auscultation
  - Pulse augmentation and arm elevation tests
- General issues relating to cannulation of either AV fistulas or grafts
  - Skin preparation
  - Anaesthesia
  - Use of tourniquets for AV fistulas.
  - Needle size
  - Needle position, spacing, and orientation

- Risk of inflow/outflow needle reversal
- Buttonhole cannulation and rope ladder
- Preventing and dealing with infiltration
- Hemostasis post-dialysis

AV access monitoring and complications

- Stenosis
- Thrombosis
- Ischemia in a limb bearing AV access
- Pseudo-aneurysm
- Congestive heart failure

C. Venovenous access

- Catheter types and design
- Insertion location
- Selected Factors favouring different temporary (Nontunneled) Hemodialysis Catheter Insertion Sites
- Cuffed catheter advantages and types
- Insertion-related complications
- Care and use of venous catheters
- Risk of air embolism on the removal of dialysis catheters from the neck.
- Catheter locks
- Prophylactic antibiotics
- Nasal decolonisation

D. Venous catheter infections and other Complications

- Infections
- Poor catheter flow (catheter dysfunction)
- Thrombosis
- Central venous stenosis
- Catheter adhesion

6. Haemodialysis apparatus

- Blood circuit
  - Inflow bloodline: Pre-pump segment
  - Roller pump segment and calibration
  - Inflow (arterial) bloodline: Post-pump segment
  - Outflow (venous) bloodline: Air trap and pressure monitor
- Dialysis fluid circuit
  - Proportioning system.
  - Heating and degassing
  - Monitors and alarms
- Conductivity
- Temperature
- Bypass valve
- Blood leak detector
- Dialysate outflow pressure monitor
- Ultrafiltration control
- Advanced control options
  - Adjustable bicarbonate

        - Variable sodium.
        - Programmable ultrafiltration
        - Monitoring UV absorbance of spent dialysate (online *Kt/V*)
        - Online sodium clearance monitors.
        - Blood temperature control module.
        - Modules to measure access recirculation or access blood flow
        - Blood volume monitors.
    - Single blood pathway ("single-needle") devices
    - Dialysers and Membranes
    - Dialysis solutions
        - Fluid quality standards
        - Ultrapure dialysis solutions
        - Different types of mixing ratios
    - Content of dialysis solution
    - Bicarbonate concentrates mixing and distribution systems.
    - Dialysis solution preparation
        - Dual-concentrate system for bicarbonate-based solutions.
        - Dry concentrates
        - Bicarbonate.
        - Acid (citric acid or sodium diacetate)
    - Final dialysis solution composition
    - Disinfection of dialysis machines
7. Acute haemodialysis prescriptions & Chronic haemodialysis prescriptions
    - Dialysis solution bicarbonate level
    - Dialysis solution Sodium level
    - Dialysis solution Calcium level
    - Dialysis solution Magnesium level
    - Dialysis solution Potassium level
    - Dialysis solution Phosphorus level. Adding phosphorus in the dialysis solution
    - Ultrafiltration guidelines
    - Dialysis solution flow rate (Qd)
    - Dialysis solution temperature
    - Blood flow rate (Qb)
    - Clearance and adequacy

8. Complications during haemodialysis
9. Biochemical investigations for dialysis patients and its significance
10. Urea Kinetic modelling
    - Mechanisms of solute transport
    - Solute removal from the perspective of the dialyser
    - Concept of clearance
    - URR, spKt/V, eKt/V
    - Solute removal from the patient perspective
    - Access recirculation
    - Cardiopulmonary recirculation
    - Urea nitrogen generation rate (g) and the nPNA

- Residual renal function

11. Anticoagulation
12. Dialyser reuse
13. Withdrawal of dialysis criteria
    - Acute dialysis
    - Chronic dialysis

14. Physiology of peritoneal dialysis
    - Anatomy of the peritoneal cavity
    - Peritoneal membrane histology
    - Models of peritoneal transport
    - Physiology of peritoneal transport
        - Diffusion
        - Ultrafiltration
        - Fluid absorption
    - Clinical assessment of and implications of peritoneal transport
    - Peritoneal equilibration test (PET) and Classification
    - Peritoneal clearance
    - Urea versus creatinine
    - Sodium removal
    - Protein losses
    - Residual renal function
15. Apparatus for peritoneal dialysis
    - Dialysis solution
    - Non-glucose solutions
    - Transfer set and exchange procedure
    - Various connectors for PD
    - Automated peritoneal dialysis
    - Tidal peritoneal dialysis (TPD)
    - APD with day time exchanges
16. Peritoneal dialysis catheter, placement and care
    - Acute and chronic catheters
    - Catheter selection
    - Catheter placement procedures
    - Special access procedures
        - Extended catheters
        - Catheter embedding procedure
    - Catheter break-in procedures
    - Acute complications of catheters
    - Complications of chronic peritoneal catheters
    - Catheter infection and management
    - Care of the chronic peritoneal catheters
    - Catheter removal and secondary embedding
17. Peritoneal dialysis for the treatment of acute kidney injury
    - Indications
    - Technical aspects

- Advantages and Disadvantages of Peritoneal Dialysis in Acute Kidney Injury
- Complications

18. Adequacy of peritoneal dialysis and chronic PD prescription
    - Modalities of peritoneal dialysis therapy and prescription
    - Measurement of clearance
    - Determinants of clearance
    - Prescription strategies to achieve clearance targets in chronic peritoneal dialysis
    - The nutritional issue in peritoneal dialysis.
    - Treatment of malnutrition
19. Volume status and fluid overload in Peritoneal dialysis
    - Assessment of fluid status
    - Mechanism of fluid overload
    - Diagnosis of peritoneal membrane dysfunction and ultrafiltration failure
        - High transporter with UFF (type I)
        - Low transporter with UFF (type II)
        - UFF with transport in the normal range (usually high-average and low-average transporters)
        - Prevention and management of fluid overload
        - Glucose sparing strategies.
        - Hypertension and Hypotension in PD.
20. Peritonitis & exit site infection
    A. Peritonitis
        - Pathogenesis
        - Diagnosis
        - Treatment
        - Prescriptions for Initial Treatment of Peritonitis with Unknown Organism type
        - Refractory peritonitis and indications for catheter removal
        - Relapsing, recurrent, and repeat peritonitis.
        - Peritonitis with catheter obstruction

    B. Exit -site and tunnel infection

21. Hernia, leaks and encapsulating peritoneal sclerosis in Peritoneal dialysis (mechanical complications)
    - Hernia
    - Abdominal wall and peri-catheter leaks
    - Respiratory complications
    - Genital Edema.
    - Back pain
    - Overfill
    - Encapsulating peritoneal sclerosis
22. Metabolic, Acid-base and electrolyte aspects of peritoneal dialysis (Metabolic complications)
    - Hyperglycaemia
    - Weight gain
    - Peritoneal protein loss
    - Lipid abnormalities
    - Hypokalemia/ hyperkalemia

- Metabolic acidosis
- Hypo/Hypernatremia

PRACTICALS–PAPER I

- Dialysis machine preparation for dialysis
- Dialyser and bloodlines priming
- A V fistula / AV graft cannulation
- Initiation of dialysis through central venous temporary and tunnelled catheters -internal jugular and femoral
- Catheter dressing
- Closing/termination of dialysis
- Single needle dialysis settings
- Post dialysis sample collections
- Preparation of acid and bicarbonate concentrates
- Reuse of dialysers - manual and reuse machines
- Machine disinfection
- Isolated ultrafiltration settings
- Dialysis machines minor troubleshooting- Treatment-related and machine-related
- Performance of peritoneal dialysis exchange

SCHEME OF EXAMINATION – PRACTICALS

The scheme of examination for **APPLIED DIALYSIS TECHNOLOGY PAPER I** Practical shall be as follows:

Distribution of marks

Type of question	Marks allotted
Spotters	20
Practical Based on **APPLIED DIALYSIS TECHNOLOGY**- paper 1	20
Viva	30
Record	10
Total	80

Distribution of Marks for University Theory and Practical Exam

Theory			Practical			Total
Theory	IA	Total	Practicals	IA	Total	
80	20	100	80	20	100	200

Reference Books:

1. Handbook of dialysis – 5th Edition – John T Daugirdass
2. Handbook of dialysis therapy – Allen R Nissenson
3. Oxford handbook of dialysis- 4th Edition
4. Core curriculum for dialysis technician 6th edition
5. KDOQI guidelines.
6. Dialysis Water and Dialysate Recommendations: AAMI

PAPER-2: APPLIED DIALYSIS TECHNOLOGY PAPER II

1. Dialysis in infants & children

- Vascular access in children
- Choice of acute dialysis modality
- Choice of chronic dialysis modality
- Dialysers and bloodlines for dialysis and CRRT
- Complications during dialysis
- Care of paediatric end-stage kidney disease patients

2. Extracorporeal treatment for poison and drug overdose

- Criteria for Consideration of Dialysis or Hemoperfusion in Poisoning
- Choice of therapy
  - Peritoneal dialysis
  - Haemodialysis
  - Haemoperfusion
  - Continuous Haemodiafiltration or haemoperfusion
- Technical requirements

- Complications
- Examples of a few drugs that can be removed by dialysis and haemoperfusion

3. **Online Haemodiafiltration (HDF)**
   - Diffusion versus convection based clearance
   - Basics of hemodiafiltration.
   - Substitution: Post-dilution, pre-dilution, and mixed dilution
   - Advantages and Shortcomings of Each of HDF Modalities
   - Technical issues
   - Prescription of HDF
   - Clinical benefits of convective therapies
   - Clinical comparisons of HDF versus haemodialysis
   - Morbidity and mortality benefits
   - Issues to be considered when applying convective modalities

4. **Continuous renal replacement therapy (CRRT)**
   - Continuous Haemodialysis (C-HD)
   - Continuous Haemofiltration (C-HF)
   - Continuous Haemodiafiltration (C-HDF)
   - Slow continuous ultrafiltration (SCUF)
   - Sustained Low-Efficiency Dialysis And Haemodiafiltration (SLED and SLED-F)
   - Clinical indications for CRRT versus intermittent renal replacement therapy
   - Differences among C-HD, C-HF, and C-HDF in the clearance of small- and large molecular-weight solutes
   - Filtration fraction
   - CRRT filters
   - Dialysates and replacement solutions
   - Methods of preparing bicarbonate-based CRRT solutions when pre-packaged solutions are not available
   - Prescribing and delivering CRRT
   - Regional citrate anticoagulation for continuous RRT
   - Isolated ultrafiltration and slow continuous ultrafiltration (SCUF)

5. **Molecular Adsorbent Recirculating System (MARS)**
   - Pathophysiology of acute liver failure
   - Indications
   - MARS techniques
   - Mechanism of action
   - Prescription
   - Advantage and disadvantage

6. **Home haemodialysis and intensive (frequent)**
   - Modality selection
   - In-center HD.
   - Technical consideration for home HD
   - Patient safety and precautions.
   - Infrastructure requirement for home HD
     - Prescription of intensive HD
       - Physiological rationale
       - Dialysis solution composition
       - Anticoagulation
       - Ultrafiltration, adjustment of target weight, and antihypertensive medications
     - Follow-up
       - Clinic visits
       - Blood tests
     - Comparative effectiveness and safety of home and intensive HD versus other modalities
     - Frequent HD
       - Short and standard frequent HD
       - Long, frequent HD
       - Long-session dialysis given three times per week or every other day
7. **Sorbet dialysis technology**
   - Principles of sorbent dialysis
   - The sorbent cartridge
   - Removal of contaminants
   - Changes to the electrolyte composition of the prime solution during pre-dialysis recirculation
   - Adjusting dialysis solution sodium
   - Adjusting dialysis solution bicarbonate
   - Sorbent based dialysis machines

8. **Plasmapheresis**

   - Indications
   - Pharmacokinetics of immunoglobulin (IG)
   - The macromolecule reduction ratio
   - Membrane plasma separation and centrifugal aphaeresis
   - Comparison of Membrane Plasma Separation and Centrifugal Aphaeresis
   - Plasma volume calculation
   - Complications
   - Replacement solutions
   - The selective aphaeresis procedure
   - LDL aphaeresis.
   - Immunoadsorption columns.
   - Double filtration plasmapheresis (DFPP)
   - Cryofiltration.

Other apheresis procedures

- Extracorporeal photopheresis (ECP)

9. Dialysis in special situations

- Patients with congestive cardiac failure
- Advanced liver disease
- Patients positive for, HBsAg & HCV
- Failed transplant
- Pregnancy

10. Telemedicine in dialysis practice

11. Water treatment system

- AAMI and EPA Maximum Allowable Levels of Contaminants in Water
- Signs and Symptoms and Possible Water Contaminant-Related Causes

Feed Water Components

- Back-flow preventer.
- Temperature blending valve
- Booster pump

Pre-treatment Components

- Chemical injection systems
- Sediment filters.
- Water softener
- Carbon adsorption
- Reverse Osmosis Systems
- Cartridge prefilter

RO System

- RO pump and motor assembly
- RO membranes
- Post-treatment Components
- Deionisation.
- Ultraviolet irradiator (UV).
- Submicron and ultrafiltration (UF)

Distribution System

- Water storage.
- Water distribution piping systems.
- Alternative Disinfection of Water Systems
- Ozone disinfection.
- Hot water disinfection systems

Bacteria and Endotoxin Bacteria testing of product water

- Bacteria assaying technique.
- Endotoxin testing of product water
- Bacteriology of Dialysate
- Conventional dialysate
- Ultrapure dialysate.
- Dialysate for infusion *(Water for online HDF)*

12. Diet in a patient with renal insufficiency and dialysis

13. Basic Cardiac Life Support

- Identify cardiac arrest
- Emergency codes
- Compression ventilation ratios
- One rescuer and two-rescuer compression and ventilation
- Pediatric and neonatal resuscitation
- Common drugs used during cardiac arrest
- Look like sound-alike drugs used in Crash cart
- Defibrillator and AED

14. Special problems in dialysis patients

A. Psychology & rehabilitation

- Depression
- Dementia/ Delirium
- Anxiety and behaviour disorders.

Other psychosocial issues in the CKD population

- Marital issues.
- Sexual dysfunction
- Socioeconomic issues
- Rehabilitation.
- Quality of life (QOL)

B. Diabetes

- Dialysis modalities for diabetes
- Hyperkalemia
- Cardiovascular disease and hypertension
- Cerebrovascular disease
- Eye problems in people with diabetes on dialysis
- Impotence

C. Hypertension

Definition and Measurement

- Pathophysiology
- Treatment

a. Prevention

b. Correction of salt and fluid overload

c. Clinical assessment of dry weight.

- Common clinical problems
- Antihypertensive drug use.
- Hypertensive urgencies and emergencies

D. Infections

- Derangement of immune functions in uremia
- Derangement of temperature control in uremia
- Bacterial infections in dialysis patients
- Viral infections
- Vaccinations

E. Bone diseases
    - Pathophysiology
    - Bone disease in CKD
    - Control of hyperphosphatemia
    - Optimising serum calcium
    - Parathyroid hormone levels
    - Aluminium toxicity

F. Hematologic abnormalities
    - Anaemia
    - Haemolysis
    - Disorder of Hemostasis

G. Nervous system and sleep disorder
    - Intracranial bleeding and ischemic stroke
    - Subclinical brain structural abnormalities
    - Diagnosis and management of epileptic seizures
    - Partial Differential Diagnoses of Chronic Dementia in Dialysis Patients
    - Seizures in Dialysis Patients
    - Sleep-related disorders
    - Peripheral neuropathy.

15. Medication administration and IV therapy

16. Quality in dialysis
- Guidelines for dialysis care
- ESRD quality initiative
- Continuous quality improvement in dialysis
- Preparation and monitoring dialysis unit for NABH and JCI accreditations
- International patient safety guidelines

17. Preparing dialysis patients for transplantation

18. Renal transplantation - principles, immunology, patients selection, surgical procedure and complications

PRACTICALS –PAPER II

- CRRT -Priming and starting treatment
- Plasmapheresis- Priming and starting the treatment
- BCLS/ACLS demonstration.
- RO water sample collection for water culture, endotoxin and chemical analysis
- RO plant monitoring and disinfection.
- Pediatric dialysis settings -Pediatric Hemodialysis, Peritoneal dialysis, CRRT and plasmapheresis
- Online HDF preparation and demonstration
- Hemoperfusion- Priming and starting treatment
- APD Machine settings

SCHEME OF EXAMINATION – PRACTICALS

The scheme of examination for **APPLIED DIALYSIS TECHNOLOGY II-PAPER II** Practical shall be as follows:
Common practical Exam for two papers with an equal weightage of marks

Distribution of marks

Type of question	Marks allotted
Spotters	20
Practical Based on paper II	20
Viva	30
Record	10
Total	**80**

Distribution of Marks for University Theory and Practical Exam

Theory			Practical			Total
Theory	IA	Total	Practical	IA	Total	
80	20	100	80	20	100	200

Reference Books:

1. Handbook of dialysis – 5th Edition – John T Daugirdass
2. Handbook of dialysis therapy – Allen R Nissenson
3. Oxford handbook of dialysis- 4th Edition
4. Core curriculum for dialysis technician 6th Edition

5. KDOQI guidelines.
6. www.uptodate.com
7. Dialysis Water and Dialysate Recommendations: AAMI

Subsidiary subjects**

Paper	Subjects	Duration	Marks	I A Marks	Total Marks
1	Medico-legal aspects of health care	10 Hours	80	20	100
2	Basic principles of blood transfusion & fluid therapy	10 Hours	80	20	100
3	Health care management	10 Hours	80	20	100

1. Medico-legal aspects of health care

- Code of ethics
- introduction
- professional ethics
- personal qualities of the medical professional

Laws Related To Medical Practice

- Medical council act
- clinical trials
- disability act
- legal aspects of medical records
- transplantation of human organ act
- prevention of food and adulteration act
- medical termination of pregnancy act, 1971
- birth and death registration act
- sex determination act
- Indian mental health act, 1987

Laws Related To Hospital Administration

- Companies act
- law of contracts
- consumer protection act

Scheme of Examination

Written (Theory): Maximum Marks: –80 marks.

No Practical or Viva-voce examination

**This is a subsidiary subject, examination to be conducted by respective colleges. Marks required for a pass is 35 marks

2. Basic principles of blood transfusion & fluid therapy

- Key Concepts
- Fluid Management & Blood Component Therapy: Introduction
- Evaluation of Intravascular Volume
- Intravenous Fluids
- Fluid Therapy
- Transfusion
- Complications of Blood Transfusion
- Alternative Strategies for Management of Blood Loss.

Scheme of Examination

Written (Theory): Maximum Marks: –80 marks.

No Practical or Viva-voce examination

**This is a subsidiary subject, examination to be conducted by respective colleges. Marks required for a pass is 35

3. Health care management

- Departments in Hospital
- Clinical services management
- Organising of support services
- Management of utility services
- Evaluation of Hospital services
- Issues related to Healthcare technology
- Present trend in healthcare technology
- Problems & constraints
- Planning & adopting appropriate technology in healthcare
- Evaluation method of health technology

Scheme of Examination

Written (Theory): Maximum Marks: –80 marks.

No Practical or Viva-voce examination

**This is a subsidiary subject, examination to be conducted by respective colleges. Marks required for a pass is 35

FOURTH YEAR B.Sc RENAL DIALYSIS TECHNOLOGY

BSc RDT IV YEAR - INTERNSHIP :

1. Project Submission: Project work is a compulsory requirement for the B Sc RDT –course. Each student can choose a topic for the project in any one of the subjects -Haemodialysis/Peritoneal dialysis/Dialysis unit Management, which would be approved by his/her supervising Teacher. Supervising Teacher should have a minimum of 3 years of teaching experience in the concerned subject.

The student should be under the guidance of the supervising staff, carry out the work on the topic selected and prepare a project report including results and references—the project report duly certified by the supervising staff and Head of the department of RDT.

One month before the ''Fourth Year university practical examination'' the project should be submitted to the HOD.

The project report evaluation will be conducted by the concerned subjects, internal and external examiners together during the Fourth Year B Sc RDT University practical examination.

2. Twelve-month compulsory rotational postings during the internship, which students have to work under the supervision of experienced staff in the following areas:

- ICU Dialysis
- Paediatric dialysis
- Peritoneal dialysis
- CRRT
- Plasmapheresis
- Haemodialysis
- Nephrology Procedure room
- Two Weeks Posting with Kidney transplant coordinator
- Two Week Posting in Emergency Department

3. **Log Book:** Maintain a daily Logbook checked and signed by In charge of the unit. Submit the monthly summary of procedures along with the logbook, checked and signed by the coordinator or in charge. Logbook assessed by Internal and External examiners during the fourth year BSc RDT University practical examination.

4. Practical and Viva.

PRACTICALS

- A V fistula / AV graft cannulation
- Initiation of dialysis through central venous temporary and tunnelled catheters
- Catheter-related complications management
- Closing/termination of new AV access dialysis
- Adequacy of dialysis
- Single needle dialysis settings
- Post dialysis sample collections.
- Acid and bicarbonate concentrate selection.
- Reuse of dialysers- quality assessment.

- Machine troubleshooting
- Isolated ultrafiltration settings
- Dialysis machines minor troubleshooting- Treatment-related and machine-related
- Performance of peritoneal dialysis exchange
- PET test
- Automated Peritoneal dialysis machine management: TIPD, CCPD
- Peritoneal dialysis- Transfer set/ Extension change
- Peritoneal dialysis – Titanium adaptor change
- Peritoneal dialysis - sample collection of PD fluid
- CRRT -Priming and starting treatment
- Plasmapheresis- Priming and starting the treatment
- BCLS/ACLS demonstration.
- DFPP settings
- RO water sample collection for water culture, endotoxin and chemical analysis
- RO plant monitoring and disinfection.
- Pediatric dialysis settings -pediatric Hemodialysis, Peritoneal dialysis, CRRT and plasmapheresis
- Online HDF machine preparation and demonstration
- Hemoperfusion- Priming and starting treatment

SCHEME OF EXAMINATION – PRACTICALS

The scheme of examination for 4th Year Practical shall be as follows, Exam based on the clinical training during the internship

Distribution of marks.

Type of question	**Marks allotted**
Spotters	40
Practical	40
Viva	30
Project	40
Log Book	20
Total	**170**

Distribution of Marks for University Theory and Practical Exam

Theory			**Practical**			**Total**
Theory	IA	Total	Practicals	IA	Total	
-	-	-	**170**	**30**	**200**	**200**

Reference books:

1. Handbook of dialysis – 5th Edition – John T Daugirdass
2. Handbook of dialysis therapy – Allen R Nissenson

3. Core curriculum for dialysis technician 6th edition

4. Oxford handbook of dialysis- 4th Edition

5. KDOQI guidelines.

6. Dialysis Water and Dialysate Recommendations: AAMI

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