

# **SYLLABUS**

for courses affiliated to the

**Kerala University of Health Sciences**

**Thrissur 680596**



**Bachelor of Science in Respiratory Technology**

**(B.Sc RT)**

**Course code: 038**

**(2024-2025 Admission Onwards)**

## **2.COURSE CONTENT**

### **2.1 Name of the course**

#### **Bachelor of Science in Respiratory Technology**

- Abbreviated as B.Sc. RT

### **2.2 Objectives of course**

Respiratory Therapy is an allied medical speciality concerned with the evaluation and treatment of patients who have breathing difficulties and respiratory diseases. Respiratory Therapists are in great demand in Speciality hospitals and hospital related organizations to provide direct patient care to those with acute and chronic respiratory problems. The field of Respiratory Therapy is growing rapidly. Diagnosis and management of respiratory disorders needing intensive care, pulmonary rehabilitation, teaching and many more research opportunities are areas that offer opportunities to the Respiratory Therapists for professional growth and personal satisfaction. Respiratory Therapist can be seen in Intensive care units, pediatric and neonatal units, and operating rooms and especially in the emergency rooms. Respiratory Therapists are cardiopulmonary specialists with vast training in both heart and lung function. The Duration of course will be four years

History: Respiratory Therapy is a subset of anesthesia and has grown considerably through the past four decades. There was a time when Respiratory Therapists were on-the-job trained technicians, with little formal education. Their main function was to ensure safe oxygen use, to administer intermittent positive pressure breathing (IPPB) treatments, to perform cardiopulmonary resuscitation (CPR), and to operate negative pressure (iron lung) ventilators. They were initially titled Inhalation Therapists. With the advent of positive pressure mechanical ventilators, the more widespread hospital provision of Neonatal and Pediatric care, more sophisticated pulmonary function testing (PFT), a need for thoroughly trained clinical practitioners presented itself. Over the years "respiratory technicians" have evolved to being college and University trained personnel who assist the physician and teach registered nurses in assessing and treating patients. Invasive skills that Respiratory therapists must master include, but are not limited to; intubation, other advanced airway placement, arterial-line insertion, Cardiac Catheter advancement, intra-venous line insertion, Tracheostomy recannulation, naso-tracheal suction, and ABG's. These skills require a great deal of practice to master.

#### **Advancement.**

Respiratory therapists advance in clinical practice by moving from general care to the care of critically ill patients who have significant problems in other organ systems, such as the heart or kidneys. Respiratory therapists, especially those with a bachelor's or master's degree, also may advance to supervisory or managerial positions in a respiratory therapy department. Respiratory therapists in home health care and equipment rental firms may become branch managers. Some respiratory therapists advance by moving into teaching positions. Some others use the knowledge gained as a respiratory therapist to work in another industry, such as developing, marketing, or selling pharmaceuticals and medical devices.

**Employment:**

Faster-than-average employment growth is projected for respiratory therapists. Job opportunities should be very good, especially for respiratory therapists with cardiopulmonary care skills or experience. The vast majority of job openings will continue to be in hospitals. However, a growing number of openings are expected to be outside of hospitals, especially in home health care services, offices of physicians or other health practitioners, consumer- goods rental firms, or in the employment services industry as a temporary worker in various settings.

**2.3 Medium of instruction:**

Medium of instruction and examinations shall be in English.

**2.4 Course Duration:**

Duration shall be for a period of four years including one year of internship.

**2.5 Subject**

<b>Paper Code</b>	<b>Subject Name</b>
First Year	
I	Anatomy
II	Physiology
III	Biochemistry
IV	Microbiology
V	Community Medicine
Second Year	
VI	Clinical Psychology
VII	Applied Pathology
VIII	General and Applied Pharmacology
IX	Applied Science I
Third Year	
X	Applied Science II
XI	Basic Sciences
XII	Applied Science III
XII	Pulmonary Rehabilitation
Fourth year	
XIII	Project +Viva

## 2.6 Total number of hours

As given in clause 2.7

## 2.7 Content of each subject in each year

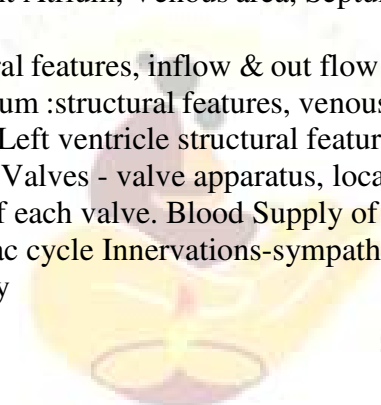
### FIRST YEAR

#### PAPER-I - ANATOMY

100 hours

An outline of anatomy with special emphasis on applied aspects is provided to the students for better understanding of the technical and diagnostic procedure.

Topic No:	Name of the Topic	No of Hours
1.	<b>The human body as a whole</b> Definition Sub divisions of anatomy Terms of location and positions Fundamental planes, Vertebrate structure of man Organization of body cells and tissue.	5 hours
2.	<b>Locomotion and Support</b> The Skeletal System Types of bones & Cartilages Skull as a whole- foramen magnum & maxilla in detail Structure and growth of bones Divisions of the skeleton, Appendicular skeleton, Axial skeleton Upper & lower limbs- bones, blood flow. Scapula & Axilla Name of all the bones and their parts Joints: Classification, Types of movements with examples.	5 hours
3.	<b>Muscles</b> Structure, Classification, Muscles of abdominal wall Muscles of respiration, Diaphragm, Muscles of head and neck	5 hours
4.	<b>Thorax</b> Thoracic cavity, wall of thorax, mediastinum, surface marking of the thorax, thoracic duct. Clinical Anatomy of Thorax	5 hours
5.	<b>Anatomy of nervous system</b> Introduction and divisions of nervous system Central nervous system, Spinal cord, Reflex arc Peripheral nervous system – organization & structure of a typical	5 hours

	spinal nerve	
6.	<p><b>The Brain:</b>  Location, gross features, parts, functional areas  Hindbrain, Midbrain, fore brain  Coverings of brain  anatomy of cerebral blood supply &amp; coverings  Spinal cord –gross features, extent, blood supply and coverings  Injuries to spinal cord and brain</p>	5hours
7.	<p><b>Anatomy of Cardiovascular system</b>  <b>Gross anatomy &amp; Structural features of the Heart and Great vessels:</b>  <b>Heart</b> :Location, size, surface features, pericardium &amp; valves  All four chambers- Right Atrium, Venous area, Septum and atrial appendage  Right Ventricle-structural features, inflow &amp; out flow characteristics  Left Atrium :structural features, venous area, Septum and appendage  Left ventricle structural features, inflow &amp; out flow characteristics  Valves - valve apparatus, location, Structure &amp; functions of each valve. Blood Supply of heart- coronary arteries, cardiac cycle  Innervations-sympathetic and parasympathetic sensory  Clinical Anatomy</p> 	5 hours
8.	<p><b>Great Vessels</b>  Structure of blood vessels and its organization &amp; musculature  Aorta and systemic arteries &amp; foetal circulation.  Venous drainage- Inferior vena cava &amp; Superior vena cava  General plan of systemic circulation &amp; collateral circulation.  Pulmonary circulation - pulmonary artery &amp; pulmonary vein  Lymphatic drainage of the Heart.</p>	5 hours
9.	<p><b>Anatomy of the Respiratory system</b>  Organs of Respiratory System  Conducting portion: Nose –nasal cavity, paranasal air sinuses  Larynx &amp; pharynx  Trachea, bronchial tree, lungs  Alveoli. Clinical Anatomy.</p>	5 hours
10.	<p><b>Organization of the respiratory system</b>  Muscles of Respiration  Gross structure, histology, position and coverings of the lungs  Pleura</p>	5 hours

	<p>Pulmonary circulation – pulmonary arteries pulmonary veins &amp; bronchial arteries</p> <p>Nerve supply to the respiratory system</p>	
<b>11.</b>	<p><b>Anatomy of the digestive system</b></p> <p>Components of the digestive system</p> <p>Alimentary tube.</p> <p>Anatomy of organs of digestive tube.</p> <p>Mouth, tongue, tooth, oesophagus, stomach</p> <p>Gastric secretion and regulation, Salivary gland, liver, biliary apparatus and its secretion, pancreas and pancreatic secretion, movements of intestine defecation, GI hormones malabsorption and Regulation. Small and large intestines.</p>	<b>5 hours</b>
<b>12.</b>	<p><b>Excretory system</b></p> <p>Kidneys-location, gross structure, blood supply and nerve supply.</p> <p>Organization of the renal system &amp; clinical anatomy.</p> <p>Excretory ducts, ureters, urinary bladder, urethra &amp; ureters</p>	5 hours
<b>13.</b>	<p><b>Male &amp; Female reproductive system</b></p> <p>Testis, Duct system, prostate.</p> <p>Ovaries, uterine tubes, uterus, vagina, duct system, accessory organs</p>	5 hours
<b>14.</b>	<p><b>Endocrine system</b></p> <p>Endocrine glands and their positions</p> <p>Hormones and their functions</p> <p>Pituitary, thyroid, parathyroid, adrenal gland &amp; gonad, islets of pancreas</p>	5 hours
<b>15.</b>	<p><b>Genetics – Karyotyping, chromosomal anomalies</b></p>	5 hours
<b>16.</b>	<p><b>Special Senses</b></p> <p>Eye, ear and skin. Clinical Anatomy</p>	5 hours
<b>17</b>	<p><b>Lymphatic organs</b></p> <p>Tonsil, Spleen, thymus. Clinical Anatomy</p>	5 hour

## HISTOLOGY

1.	<b>General Slides:</b> Hyaline cartilage. Fibro cartilage. Elastic cartilage. T.S&L.S of bone. Blood vessels. Tonsils, Spleen, Thymus. Lymph node, Epithelial tissue. Skeletal and cardiac muscle. Peripheral nerve and optical nerve	5 hours
2.	<b>Systemic Slides:</b> G.L.T –all Lung Parenchyma Kidney pituitary Endocrine- Adrenal, pancreas, pituitary, thyroid and parathyroid Uterus, ovary, testis.	5 hours

### *Demonstrations*

1.	Demonstrations of all bones, Showing parts joints, X-rays of all normal bones and joints.	
2.	Demonstration of brain and spinal cord, Histology of cerebrum.	
3.	Demonstration to illustrate normal angiograms.	
4.	Demonstration of surface features & interior of the heart.	
5.	Demonstration of aorta and its branches.	
6.	Histology of cardiac muscles and artery.	
7.	Muscles: Striations and classification of muscle.	
8.	Diaphragm-Insertion, openings, relations.	
9.	Histology of lungs & x rays, stages of respiration.	
10.	Identification of Kidney, spleen, liver, stomach, pancreas.	
	Total hours for demonstration	5

Topic No:	Name of the Topic	No of hours
	<b>BLOOD:</b> Composition properties and functions of blood - Intro.	
1.	<b>R.B.C:</b> Size, Shape, functions, count, physiological variations of RBC count. Polycythemia, erythropoiesis. Haemoglobin function, concentration, physiological variation and concentration & methods of determination of haemoglobin. Life span & destruction.	1 hour
2.	<b>W.B.C:</b> Functions, production, life span count, differential count leukocytosis, leucopenia , leukemia	1 hour
3.	<b>Platelet:</b> Size, shape, count production, thrombocytopenic purpura, bleeding time and clotting time.	1 hour
4.	<b>Plasma Proteins:</b> Concentration, production, albumin, globulin, fibrinogen. Prothrombin & functions of plasma proteins	1 hour
5.	<b>Blood Grouping:</b> ABO & Rh grouping, Criteria of classification Antigen and antibodies, Genetics and inheritance, percentage of distribution. Determination of blood groups.LAN Steiner's Law & Significance of blood group	2 hours
6.	<b>Blood transfusion:</b> Indication, general qualities of a donor Matching of donors blood with recipients blood Universal donor and recipient concept. Blood grouping or typing, cross matching. Mismatched blood transfusion – Causes and complication. Rh factor and Rh factor incompatibility Transfusion and erthroblastosis and foetalis.	2 hours
7.	<b>Anemia:</b> Definition, classification, major causes Types of anemia, Effects of anemia on body treatment	2 hours
8.	<b>ESR and PCV:</b> Determination, definition, values Variation factors affecting significance.	1 hours
9.	<b>Blood Volume:</b> Normal value, determination of blood volume and regulation of blood volume. Body fluid, pH, normal values, variation and regulation	1 hours
10	<b>Hemostasis :</b> vasoconstriction, platelet plug formation Blood coagulation- definition, clotting factors Mechanism of blood clotting-intrinsic and extrinsic factors Intravascular blood clotting, disorders of clotting & anticoagulants. Vitamin K Deficiency bleeding, purpura, haemophilia.	1 hour



11.	<p><b>Cardiovascular System:</b> Functions of cardiovascular system and blood circulation, Tissue perfusion and microcirculation Cardiac Cycle - Various phases , Cardiac output: definition and measurement - Regulation and control</p> <p>Heart rate and pulse, Stroke volume, Vascular distensibility and Functions of arterial and venous systems , Arterial pressure pulsations and its regulation, Venous return, Cardiac metabolism, Cardiac cycle with reference to the waveforms of pressure tracing Heart as a pump, Physical characteristics of atrium, ventricles &amp; valves, Mechanism of contraction. Organization of pacemaker &amp; conduction system types of artificial pacemakers. Cardiac excitation and contraction. Specialized conduction tissues, Sinus node, Inter nodal tracts, AV node, bundle of his, Bundle branches, Nodal electricity, and Nervous control of HR.</p>	5 hours
12.	<p><b>Cardio vascular regulatory mechanism</b></p> <p>Local: Vasodilatation, Auto regulation(myogenic theory) Vasodilator metabolites. Kinins &amp; vasoconstriction. Systemic: - Circulatory vasoconstrictors. Neural and hormonal regulatory mechanism, Cardio inhibitory center. Vasomotor center Baro &amp; chemoreceptors, Movements of fluids &amp; dissolved solutes in the body Control of stroke volume and cardiac out put Specialization in individual circulation: Coronary circulation, Renal circulation Cerebral circulation, Pulmonary circulation, Cutaneous circulation. Coordinate cardiovascular responses-posture Valsalva maneuver &amp; exercise</p>	5 hours
13.	<p><b>Basics of ECG:</b> Definition Electrical conduction, normal and abnormal ECG. Interpretation of normal and abnormal ECGs</p>	4 hours
14.	<p><b>Muscle Nerve Physiology:</b> Membrane and action potentials, Contraction &amp; excitation of skeletal muscle and smooth muscle. Neuromuscular junction, transmission, neuromuscular junction, coupling, mechanism of muscle contraction, muscle tone, fatigue.</p>	3 hours

1.	<p><b>Demonstration:</b></p> <p>Recording of blood pressure Sphygmomanometer Measuring pulse rate (normal &amp; following exercises) ECG description and drawing Demonstration of abnormal ECGs Auscultation of heart sounds and interpretation</p>	5 hours
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<b>Respiratory System</b>		
15.	<b>Introduction</b> to the respiratory system, physiological anatomy of respiratory system, muscles of respiration, pulmonary circulation, pulmonary capillary dynamics, and fluids in the pleural cavity respiratory passage ways. Functions of tracheobronchial tree, lower airway & alveoli, respiratory membrane	2 hours
16.	<b>Regulation of Respiration:</b> Stages of respiration, mechanism of normal and rigorous respiration, Respiratory centre, Chemical control of respiration, peripheral chemoreceptor system for control of respiration & role of oxygen in the respiratory activity. Regulation of respiration during exercise.	5 hours
17.	<b>Physical principles of gaseous exchange:</b> Diffusion of oxygen and carbon dioxide through the respiratory membrane. Physics of gas diffusion and gas partial pressures, Composition of alveolar air & its relation to atmospheric air Macrophages and surfactant, transportation of respiratory gases. Transportation of oxygen and carbon dioxide in blood and tissue fluids.	3 hours
18.	<b>Pulmonary Volumes and capacities:</b> Spirometry and spirogram,	4 hours
19.	<b>Role of Thorax in Respiration :</b> Forces opposing and favoring expansion of lungs, intra pulmonary pleural pressure Surface tension, recoil tendency of the chest wall & principles of elasticity. Effect of ventilation perfusion ratio on alveolar gas concentration Compliance & airway resistance, Shunting & dead space, Concept of physiologic shunt & shunt effect.	5 hours
20.	<b>Alveolar Ventilation &amp; dead space.</b> The mucus blanket mucus & cilia, Lung – thorax relationship.	2 hour

### Applied physiology of respiration

1.	Respiratory insufficiency- pathophysiology, diagnosis, oxygen therapy.	5 hours
2.	Hypoxia, Cyanosis, Asphyxia, Dyspnea and Respiratory organ failure	3 hours
3.	Artificial respiration & apnea	1 hour

### Demonstration

1.	Spirometry & spirogram interpretation, stethoscope, monitoring oxygenation, physical examination	5 hours
2.	Auscultation of the chest for lung sounds	
3.	Description of normal findings, monitoring of blood pressure, ECG, Saturation, blood gases.	

	<b>Endocrine System</b>	
21.	<b>Hormone:</b> local and general hormones, properties of hormones, mechanism of action of hormones-AMP, major endocrine glands of body and their locations.	1 hour
22.	<b>Pituitary:</b> Situation master gland anterior and posterior Anterior pituitary hormones, functions of each one of them. Dwarfism, Ac- romegaly, Gigantism , regulation of secretion of each hormone Posterior pituitary: ADH, and oxytocin scare (Chemistry) functions, regulation of secretions, diabetes insidious	1 hour
23.	<b>Thyroid gland:</b> Physiological location, hormone secreted, func- tions, regulation of secretion. Endocrine disorders <b>Adrenal gland:</b> adrenal cortex-hormones secreted, gluco corticoids, mineralocorticoids, sex steroids, functions regulation of secretion Aldosterone	1 hour
24.	<b>Adrenal Medulla:</b> Functions of adrenaline and nor adrenaline, regu- lation of secretion <b>Pancreas:</b> Hormones of pancreas, insulin, function and actions reg- ulation of secretion, diabetes mellitus, regulation of se- cretion, regulation of blood glucose level, parathyroid gland PTH function and actions, regulation of secretion hypo and hyper secretion of PTH, regulation of secretion	1 hour
25.	<b>Nervous system:</b> Functions of nervous system, neuron structure, classification and properties, neuroglia, nerve fiber, conduction of impulses, transmission of impulses, factors affecting transmission.	1 hour
26.	<b>Synapse:</b> structure type properties <b>Receptors:</b> classification & properties. Reflex action: unconditioned properties of reflex action, spinal cord nerve tracts, ascending tracts, descending tracts, pyramidal tracts, extra pyramidal tracts, Functions of medulla pons, hypothalamic disorders,Cerebral cortex lobes and functions, sensory cortex, medullary cortex, EEG	1 hour
27.	<b>Cerebrospinal fluid:</b> Formation circulation properties, composition and functions, hydrocephalus lumbar puncture <b>Auto- nomic nervous system:</b> sympathetic and parasympathetic distribution and functions	1 hour
28.	<b>Spinal Senses</b> <b>Vision:</b> structure, accommodation changes, field of vision, dark and light adaptation, visual cycle structure of retina, rhodes and cones structure and functions, visual pathway, Papillary reflexes and its pathway colour, colour blindness, tests for colour blindness <b>Hearing:</b> Outer middle and inner ear, cochlea, mechanism of hear- ing, auditory pathway, deafness. <b>Taste:</b> Taste buds, primary taste, pathway for taste <b>Smell:</b> Receptors, primary olfaction, olfactory pathway	2 hours
29.	<b>Metabolism and temperature regulation:</b> Regulation of body temperature-role of the hypothalamus, abnormalities of the body temperature regulation, fever.	2 hours
30.	<b>Digestive System:</b> Physiological anatomy of G.I.T, Structure and functions of salivary glands-saliva-properties, deglutition, structure and functions of the stomach, properties, composition and functions of gastric juice, regulation of gastric juice secretion, gastric diges- tion, functions of	3 hours

	pancreas, composition, properties and functions of pancreatic juice, regulation and secretion of pancreatic juice Functions of Liver: properties composition and functions of bile regulation of bile secretion, gall bladder functions, functions of large intestine, regulation of intestinal secretion, composition and functions of success entericus, movements of small intestine –peristalsis, pendulum movements, rhythmic, movements movements of large intestine - digestion and absorption of carbohydrate digestion and absorption of protein, digestion and absorption of fat lipids defecation	
31.	<b>Mechanism of Urine Formation:</b> Organization and functions of renal system, renal circulation and glomerular filtration rate (GMR) Mechanism of urine formation and excretion, Renal function tests Ultra filtration criteria for filtration GFR, plasma fraction, determination of GFR, selective reabsorption, Mechanism of reabsorption glucose urea, Hydrogen ions , chloride ions and amino acids etc. TMG, tubular load, renal threshold % of reabsorption of different substances, selective secretion. Properties and composition of normal urine, urine output abnormal constituents in urine, mechanism of urine concentration, Counter – current mechanisms- Micturition, diuretics artificial kidney Renal function tests-plasma clearance, actions of ADH aldosterone, and PTH of kidneys	3 hours
32.	<b>Excretory System - Kidneys:-</b> Nephron, Vasa recta, cortical and juxtamedullary nephrons, comparison, juxta glomerular apparatus-structure and functions, renal circulation peculiarities	1 hour
33.	<b>Reproductive system:</b> Puberty, functions of testis, spermatogenesis site, stages factors influencing semen, endocrine functions of testes - testosterone structure and function, female reproductive system ovulation, menstrual cycle, physiological changes during pregnancy, pregnancy test, parturition family planning methods; safe period pills, permanent methods, actions of estrogen, progesterone functions of placenta, lactation-composition of milk factors, controlling lactation	2 hours

## Demonstration

1.	Study of microscopes and its uses	10 hours
2.	Collection of blood and haemocytometer	
3.	Haemoglobinometry	
4.	Determination of specific gravity of blood	
5.	White blood cell count	
6.	RBC counts	
7.	Determination of blood groups	
8.	Leishmans staining and differential WBC count	
9.	Determination of PVC (packed cell volume)	
10.	Calculation of blood indices	
11.	Fragility test for RBC	
12.	Determination of bleeding time	
13.	Determination of clotting time	
14.	Blood pressure recording	
15.	Auscultation of heart sounds	
16.	Artificial respiration, Determination of vital capacity	
17.	Stethography	
18.	Clinical examination of reflexes.	
19.	Effect of posture and exercise on BP and pulse.	
20.	Clinical examination of CVS	

Total Theory hours: 80  
Demonstration 20

### **Attention: Demonstration & Practical**

- \* Practical classes will be only two hour after the theory portions; it will be an orientation class to the common procedures and equipments used in physiology.
- \* There will be no university practical examination for physiology

Total lecture hours allotted for theory and demonstration- Physiology – 100 hours/year

1.	<b>Introduction to apparatus:</b> Chemical Balance concept of molecular weight, atomic weight, normality and molarities, standards.	1 hour
2.	<b>Atomic structure:</b> Valence, acids, bases, salts and indicators Concept of acid base reaction and hydrogen ion concentration, pH, pH meter pH buffers	2 hours
3.	<b>Chemistry of carbohydrates</b> - Structure , classification, examples	2 hours
4.	<b>Chemistry of proteins</b> - Structure , classification, examples	2 hours
5.	<b>Chemistry of Nucleic acids</b> - Structure , classification, examples	2 hours
6.	<b>Vitamins</b> - Classification, chemical nature, deficiency. Co-Enzymes form, biochemical role, sources, requirement, deficiency and toxicity of following vitamins – A, D, E, K Deficiency of thiamin Riboflavin, niacin, biotin, pyridoxine, pantothenic acid, folic acid , one carbon groups And B12 ascorbic acid	3 hours
7.	Cell structure and functions, sub cellular organelles, biomembrane	2 hours
8.	Digestion and absorption of nutrients & transport of irons.	2 hours
9.	<b>Enzymes:</b> Nature, co-enzymes, co-factors, classification, Mechanism of action, specificity of enzymes, active sites, enzyme kinetics, factors affecting enzyme activity, Km value and significance, enzyme inhibition-competitive, allosteric	2 hours
10.	<b>Chemistry of amino acids</b> –classification based on structure Ionic properties of amino acids, isoelectric pH, buffering action of amino acids & Proteins. Electrophoresis & Chromatography-brief mention on separation techniques, plasma proteins and immunoglobulin's.	2 hours
11.	<b>Chemistry and metabolism of carbohydrates</b> Classification – monosaccharide's, glucose, fructose galactose and mannose, derivatives like amino sugars, deoxisugars, glycosidic bond, disaccharides , lactoser, sucrose, maltose, polysaccharides, glycigen, detrins, glycosaminologlycans (basic structural features, functions only)	3 hours
12.	<b>Minerals:</b> Sources, Requirements absorption, biochemical role, deficiency and toxicity of following minerals , Ca & Phosphorus , role of PTH , 1.23 DHCC & CT, Trace elements-Zn , F , I, Se, Mg, Fe, Cu.	3 hours
13.	<b>Lipids:</b> Classification with examples, Saturated & unsaturated fatty acids, Triacylglycerole phospho lipids Cholesterol-structure, synthesis, regulation, metabolic fate, bile acids and steroids from cholesterol	2 hours

14.	<b>Proteins and amino acids</b> Chemistry and metabolism, functions of proteins in the body. Essential and non essential amino acids, Peptides.	2 hours
15.	<b>Nucleic Acid:</b> Structure of purins, pyrimidines, nucleosides, and nucleotides. RNA and its different type functions DNA replication, DNA polymerase, DNA repairs. Gout, Lesch nyhan syndrome, Purine and pyrimidine - catabolism and its clinical disorder.	2 hours
16.	<b>Blood glucose regulation</b> – action of insulin, glucagon's, cortisol, growth hormones. Diabetes mellitus-aetiology, biochemical abnormalities, symptoms and complications. Glycosurias-differential diagnosis of reducing sugars.	3 hours
17.	<b>Hemoglobin:</b> Synthesis and degradation	2 hours
18.	<b>Liver Function Tests</b>	2 hours
19.	<b>Metabolism: Interrelation</b> of carbohydrates, lipids, and amino acid metabolism, anaphylactic reactions.	2 hours
20.	<b>Maintenance of homeostasis &amp; Acid base regulation</b> Acid and bases, PH buffers, Henderson Hasselbalch's equation buffer capacity, acid and base in the body, plasma buffers respiratory and renal regulation of pH, acidosis and alkalosis Major causes and compensatory mechanism anion gap, assessment of acid and base status, fluid electrolyte balance-distribution of body water and disorders.	5 hours
21.	<b>Renal function Test:</b> Clearance test, test for tubular function, NPN, Urine analysis	2 hours
22.	Biochemistry of Cancer Mutagens, carcinogens, role in carcinogenesis, tumor markers and oncogens.	2 hours

## Clinical Biochemistry

1.	Specimen collection : Collection of Blood, Urine, CSF, Other body fluids	2 hours
2.	Basic Principles of routine biochemical investigation	1 hour
3.	LFT and assessment	2 hours
4.	RFT and assessment	2 hours
5.	Evaluation of Important hormones	1 hour
6.	Cardiac Profile: Biochemical markers of Myocardial Infarction Basic Principles	2 hours
7.	Enzymes: Classification, Therapeutic significance	2 hours
8.	Nutrition : Nutrient requirement, Digestion absorption	1 hour
9.	Regulation and evaluation of acid base status	3 hours
10.	Principles and evaluation of Blood Gases & pH	2 hours
11.	Basic Principles and estimation of electrolytes	2 hours
		20 hours

**Paper IV MICROBIOLOGY****30 hours**

Topic No	Name of the Topic	No of Hours
1.	Introduction & history of microbiology	1 hour
2.	Morphology and physiology of bacteria	1 hour
3.	Sterilization and disinfections	2 hours
4.	Normal Microbial flora of the human body Shape and arrangement, Special characteristics- spores, capsules, motility, reproduction.	1 hour
5.	Infection- source, source of entry, spread of infection. Two day special training in infection control practices at the bed side-by AIMS infection control department.	2 hours (2 days)
6.	Hospital acquired infections and prevention of hospital acquired infections, enteric infections, urinary tract infections, anaerobic infections, wound infections, yeasts and fungi.	2 hours
7.	Immunity, non-specific immunity, natural & acquired	1 hour
8.	Antigen antibodies, antigen anti-body reactions	1 hour
9.	Immune response	1 hour
10.	Hypersensitivity & allergy	1 hour
11.	Immunoprphylaxis	1 hour
12.	Antibiotics	1 hour
13.	Mycobacterium tuberculosis	1 hour
14.	General properties of virus & virology	1 hour
15.	Virus host interactions-virus infections	1 hour
16.	HIV / AIDS, other sexually transmitted infections	1 hour
17.	Medical mycology	1 hour
18.	Medical parasitology	1 hour
19.	Upper respiratory tract infections	2 hours
20.	Lower respiratory tract infections	3 hours

**Practical and Demonstration**

1.	Gram stain	1 hour
2.	Acid fast stain	2 hours
3.	Antibiotic susceptibility testing	
4.	Visit to CSSD and microbiology clinical laboratory ( One week postings in rotation )	1 hour

Total Theory hours: 30



Topic No	Name of the Topic	No of Hours
1.	Introduction to community medicine and concept of health	1 hour
2.	Concept of disease	1 hour
3.	Communicable disease (water born)	1 hour
4.	National health programmes – 1	1 hour
5.	Communicable disease (contact-born & zoonoses)	1 hour
6.	Health care delivery system including primary health care	1 hour
7.	Health care of the community	1 hour
8.	Occupational health control	1 hour
9.	National health programmes - 2	1 hour
10.	Management of public health administration	1 hour
11.	Socio-cultural factors in disease	1 hour
12.	Health education – 1	1 hour
13.	Biostatistics	2 hours
14.	Concepts of nutrition	1 hour
15.	Fundamentals of epidemiology	1 hour
16.	Scope of epidemiology	1 hour
17.	Communicable disease (air born)	1 hour
18.	Communicable disease (vector born)	1 hour
19.	Occupational health hazards – 1	1 hour
20.	Principles in public health administration	1 hour
21.	Occupational health hazards – 2	1 hour
22.	Occupational health control	1 hour
23.	RCH	1 hour
24.	IEC	1 hour
25.	Health education – 2	1 hour
26.	Research methodology - 1	1 hour
27.	Therapeutic diet	1 hour
28.	Health education- 3	1 hour
29.	Research methodology – 2	1 hour

**Visit to Community Health Centers**

1.	Visit to RHTC- PKR/NOM/APR/RM/SNT	1 day
2.	Visit to UHTC- PKR/NOM/APR/RM/SNT	1 day

Total Theory hours: 30
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Second Year

**Paper- VI CLINICAL PSYCHOLOGY**

**25 hours**

Topic No	Name of the Topic	No of Hours
1.	<b>Introduction to Psychology:</b> Early Origins, Different Schools of thoughts, Different branches in Psychology	1 hour
2.	<b>Methods in Psychology:</b> Introspection, Observation, Interview, Experimental Methods – Independent, dependent and extraneous variables, Case Study, Survey, Correlation Method, Rating Scales, Advantages and disadvantages of each method	1 hour
3.	<b>Biological Basis of Behavior:</b> Biological Psychology – Basics of genes, Methods of genetic study in psychology, Nervous System, Neurotransmitters, Glands	1 hour
4.	<b>Sensation and Perception:</b> Sensation definition, nature of sensation, Principles of sensation, Psychophysics – Absolute and Differential Threshold, Methods of Psychophysics, Sensory Adaptation, Basics of Visual Sensation, Auditory Sensation, Gustatory, Olfactory, Kinesthetic Sensations, Attention, Factors determining attention, Types of attention, Consciousness definition	2 hours
5.	<b>Perception :</b> Definition, Principles of perceptual Organization, Perceptual constancies, Depth perception, Monocular and binocular cues, Apparent motion, Factors affecting perception, Errors in perception	2 hours
6.	<b>Learning:</b> Definition, Theories of learning – Trial & error, Associative, Cognitive, Observational, Laws of Learning – Law of readiness, exercise, effect, primacy, recency, intensity. Classical conditioning- Unconditioned response, unconditioned stimuli, Conditioned stimuli, conditioned response, principles of conditioned learning. Operant conditioning- Definition, Reinforcement, types of reinforcement, schedules of reinforcement. 3 types of cognitive learning – latent, concept, insightful. Factors influencing learning – associated with the learner, material and the process. Transfer of learning – types of transfers, Study habits, SQ4R method.	3 hours
7.	<b>Thinking :</b> Definition, building blocks of thoughts – images, concepts, language, Reasoning, types of thinking, problem solving, steps in problem solving, strategies in problem solving – trial & error, algorithm, heuristics, information retrieval, Barriers to effective problem solving, Convergent & divergent thinking, Creative thinking – definition, stages, Language – definition, structure of language, behaviorist nativist, interactionist theory of language acquisition.	2 hours

8.	<b>Intelligence :</b> Definition, IQ, Classification of IQ, Mental Retardation, Types of Mental retardation, Theories of intelligence - Primary Mental Abilities, Two Factor Theory, Multifactor Theory, Theory of Multiple Intelligence, Three Dimensional Theory, Crystallized & Fluid Intelligence , Triarchic Theory	2 hours
9.	<b>Motivation:</b> Human behavior and motives, process of motivation, characteristics of motivation, intrinsic, extrinsic, instincts, types – biological, social, personal, theories of motivation, frustration & conflicts, types of conflicts, loss of motivation, factors contributing to loss of motivation.	2 hours
10.	<b>Emotions:</b> Definition, Components, Theories of emotion, Changes during emotions, Emotional adjustment, Emotions in health and illness.	1 hour
11.	<b>Personality:</b> Definition, Development of personality, Types of personality, Theories of personality.	1 hour
12.	<b>Developmental Psychology:</b> Life span perspective, Nature of development, Principles of development, Factors influencing development, Stages of development.	1 hour
13.	<b>Psychological Assessment:</b> Definition, Types, Principles of test development, Characteristics, Psychological tests, Interpretation.	1 hour
14.	<b>Mental Health:</b> Concepts of mental hygiene and mental health, Definition, Characteristics of mentally healthy persons, Warning signs of poor mental health, Mental illness (schizophrenia, mood disorder, anxiety disorder), Life style and Mental Health.	1 hour
15.	<b>Stress:</b> Nature and source of stress, Types of stress- Pressure, Conflicts, and Frustration, Coping with stress, Stress and health.	1 hour
16.	<b>Counseling:</b> Definition, Principles and elements of counselling, Characteristics of counselor.	2 hours
17.	<b>Social Psychology:</b> Basics of person perception, attitudes, conformity, attribution, interpersonal attraction, and groups.	1 hour

Topic No	Name of the Topic	No of Hours
1.	Introduction to pathology	1 hour
2.	Cell injury and cellular adaptation – Necrosis, Different types of necrosis.	1 hour
3.	Fluids and Haemodynamic derangements – Oedema, Pathogenesis of renal and cardiac oedema, Shock, Thrombosis	1 hour
4.	Inflammation and healing – Vascular changes, vascular permeability, cellular events- margination, chemotaxis, phagocytosis. Healing & Repair – Process of healing by primary intention & secondary intention, factors influencing wound healing.	2 hours
5.	Infectious and parasitic disorders: Tuberculosis, Leprosy, AIDS/HIV infection and pathogenesis	2 hours
6.	Neoplasia – Nomenclature, metaplasia, dysplasia, anaplasia, hyperplasia and hypertrophy. Benign and malignant tumour	2 hours
7.	Environmental and nutritional diseases	2 hours
8.	The blood vessels and lymphatics- atherosclerosis & aneurisms	1 hour
9.	The heart- MI and RHD	1 hour
10.	The lymphoid system	1 hour
11.	The respiratory system – Aetiology, types and clinical features of Emphysema, bronchitis, bronchiectasis, Asthma, Pneumonia	1 hour
12.	The gastrointestinal tract- Carcinoma of oesophagus, gastric and duodenal ulcers, viral hepatitis.	1 hour
13.	The liver , biliary tract and exocrine pancreas	1 hour
14.	The kidney and the lower urinary tract	1 hour
15.	The endocrine system – goiter, diabetes	1 hour
16.	The musculoskeletal system	1 hour
17.	The nervous system- meningitis, Encephalitis, CNS tumours	1hour
18.	Techniques for the study of pathology (3hr)	1 hour
19.	Diagnostic cytopathology	1 hour
20.	Hematology- disorders of the RBC, bleeding disorders, anemia, Iron-deficiency anemia, Vit B12 deficiency, sickle cell anemia, platelet disorders. Diseases of WBC- leukemia, lymphoma.	1 hour

### Demonstration

1.	Demonstration of slides & laboratory visit	6 hours
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Total Theory hours: 30
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Topic No	Name of the Topic	No of Hours
1.	<b>Terminology:</b> Classification of drugs, principles of drug administration and routes of drug administration. Distribution, metabolism, excretion of drugs, factors influencing drug action factors modifying drug action, drug allergy and toxicity mechanism of drug action (Various ways in which they act)	2 hours
2.	<b>Autonomous nervous system:</b> Anatomy and functional organization, list of the drugs acting on ANS including dose, Route of administration, indications, contraindications, adverse effects.	1 hour
3.	<b>Cardiovascular drugs:</b> Enumerate the mode of action & Side effects and Therapeutic uses of the following drugs, antihypertensive, beta-adrenergic antagonists, alpha-adrenergic antagonists, peripheral vasodilators, calcium channel blockers, anti arrhythmic drugs, cardiac glycosides, sympathetic and non sympathetic inotropic agents, coronary vasodilators, anti anginal anti failure agents. Lipid lowering and anti atherosclerotic drugs. Drugs used in hemostasis. Anticoagulants, Thrombolytics Anti thrombolytics, drugs used in the treatment of shock	4 hours
4.	<b>Anaesthetic Drugs :</b> Definition of local and general anaesthetics Classification of general anaesthetics. Pharmacokinetics and pharmacogenetics of inhaled anaesthetic agents, Intravenous general anaesthetic agents Local anaesthetic- Classification, mechanism of action, duration of action, preparation, pulmonary effects of general anaesthetic agents, local anaesthetic agents. NMBs	4 hours
5.	<b>Analgesics:</b> Definition and classification, Routes of administration, Side effects, Management of non-opioid and opioid analgesics	2 hours
6.	<b>CNS stimulants &amp; depressants:</b> Alcohol, Sedatives hypnotics and narcotics, CNS stimulants, Neuromuscular blocking agents and muscle relaxants, sedative hypnotics-barbiturates, benzodiazepines.	2 hours
7.	<b>Pharmacotherapy of Respiratory Disorders:</b> Modulators of bronchial smooth muscle tone & pulmonary vascular smooth muscle tone. Pharmacotherapy of Bronchial asthma Pharmacotherapy of cough, mucokinetic and mucolytic agents Pulmonary effects of general anaesthetic agents, local anaesthetic agents, Use of bland aerosols in respiratory care.	4 hours

8.	<b>Corticosteroids:</b> Classification, mechanism of action, adverse effects and complications, preparation, ROA, classification of synthetic corticosteroids	1 hour
9.	<b>Antihistamines &amp; antiemetics:</b> Classification & mechanism of action, adverse effects & preparations, routes of administration	1 hour
10.	<b>Diuretics:</b> Renal physiology, site of action of diuretics, adverse effects, preparation & dose, route of drug administration	1 hour
11.	<b>Chemotherapy of Infections:</b> Classification and mechanism of action of antimicrobial agents. Combination of anti microbial agents. Chemo prophylaxis, Classification & Spectrum of activity. ROA. Penicillin Cephalosporin's, Amino glycosides Tetracycline's, Chloramphenicol, Antitubercular drugs	1 hour
12.	<b>Miscellaneous:</b> IV fluids – various preparations and their usage Electrolyte supplements, immunosuppressive agents, new drugs included in respiratory care, new drugs used in metabolic and electrolyte imbalance.	3 hours
13.	<b>Drug toxicity &amp; safety</b>	1 hour
14.	<b>Prescription and pharmaceutical calculations</b>	1 hour

### Demonstration

1.	Prescription of drugs of relevance	
2.	Experimental pharmacology directed to show the effects of commonly used drugs	
3.	Relevance and interpretation of few charts	
4.	Calculation of drug dosage	

Topic No	Name of the Topic	No of Hours
1.	<b>Patient contact techniques</b> Verbal & Non-verbal communication, Patient interview and examination, Conflict and conflict resolution	2 hours
2.	<b>Medical History Taking:</b> Social history, categories, common errors in history taking. Maternal and perinatal / neonatal history, medication history.	1 hour
3.	<b>Record keeping:</b> Legal aspects of record keeping, components of medical record, POMR, review data in patient record, respiratory care orders, and progress notes. Clinical laboratory data interpretation	2 hours
4.	<b>Physical examination of the patient:</b> Chest topography (identification of imaginary lines and topographical landmarks) & assessment of the chest. Sensorium, emotional state and ability to cooperate, level of pain.	1 hour
5.	<b>Examination of the respiratory and cardiovascular system.</b>	2 hours
6.	<b>Lung sounds</b> (including demonstration)	2 hour
7.	<b>Heart sounds</b> (including demonstration)	1 hour
8.	<b>Assessment of other body systems:</b> Abdominal organs, neurological status, skin and its extremities, temperature, digestive and renal system, reproductive system.	3 hours
9.	<b>Techniques of percussion &amp; palpation</b>	1 hour
10.	<b>Nutritional status:</b> Types of diets, caloric needs	1 hour
11.	<b>Apgar score.</b> L/S ratio, gestational age	1 hour
12.	<b>RAMSAY</b> sedation scale, GCS	1 hour
13.	<b>Vital signs</b>	1 hour
14.	<b>Symptoms of respiratory disorders:</b> Cough & pharmacotherapy of cough Haemoptysis- causes and emergency management Dyspnea – types and causes Cyanosis- acute and chronic causes Nasal flaring and jaw breathing, paradoxical breathing Causes for the use of accessory muscles for respiration.	6 hours
15.	<b>Inspection of the chest</b>	1 hour
16.	<b>Symptoms of cardiovascular disease</b>	1 hour
17.	<b>Universal precautions</b>	1 hour
18.	<b>Bedside assessment of the patient</b>	1 hour
19.	<b>Principles of infection control:</b> Infection control strategies in the hospital setting. Importance of best infection control practices in Respiratory care	3 hours
20.	<b>Bronchial hygiene therapy (BHT)</b> Physiology of airway clearance, goals and indications	2 hours
21.	<b>Lung expansion therapy (LET)</b> Causes and types of atelectasis, clinical sign of atelectasis, Consolidation of lung	2 hours

22.	<b>Chest physical therapy (CPT)</b> Indications, ideal patient for therapy, preparing the patient for the procedure, techniques, classification of exercises, physiologic response to exercises, monitoring during the procedure	2 hours
23.	<b>Breathing exercises:</b> different deep breathing exercises, design a programme- intensity, frequency, duration and mode	1 hour
24.	<b>Postural drainage therapy</b>	1 hour
25.	<b>Airway clearance techniques:</b> suctioning, suction catheters	1 hour
26.	<b>Basic life support (BLS) adult</b>	2 hours
27.	<b>Basic life support (BLS) pediatric</b>	2 hours
28.	<b>Foreign body airway obstruction and management</b>	1 hour
29.	<b>Infant basic life support</b>	1 hour
30.	<b>Applied aspects of anatomy and physiology of lungs (Revision)</b>	2 hours

31.	Acute sinusitis	1 hour
32.	Acute pharyngitis	1 hour
33.	Laryngo tracheitis & Epiglottitis	1 hour
34.	Bronchitis & bronchiectasis	1 hour
35.	Pulmonary embolism	1 hour
36.	Lung cancer & Lung abscess	1 hour
37.	Pneumonia (community acquired)	1 hour
38.	Pneumonia (hospital acquired)	1 hour
39.	COPD	1 hour
40.	Immuno compromised host	1 hour
41.	Pneumothorax	1 hour
42.	Pleural diseases & pleural effusion	1 hour
43.	Pulmonary edema and management	1 hour
44.	ALI/ARDS/Severe acute respiratory distress syndrome (SARS)	1 hour
45.	Toxic inhalation & smoke inhalational injury	1 hour
46.	Acute respiratory failure	1 hour
47.	Viral and fungal lower respiratory tract infections	1 hour
48.	Upper respiratory tract infections	1 hour
49.	Occupational lung disease	1 hour
50.	Sleep disorders	1 hour
51.	Asthma	1 hour
52.	Eosinophilia	1 hour
53.	Pulmonary hypertension	1 hour
54.	Flail chest, diseases of the mediastinum and the chest wall	1 hour
55.	Dyspnea and management	1 hour
56.	Myasthenia gravis & Gullian barre syndrome	1 hour
57.	Snake bite, near drowning, poisoning, hanging, Tetanus poisoning, burn injury.	1 hour
58.	Restrictive lung disorders	2 hours
59.	Mechanics of breathing including compliance and resistance	1 hour
60.	Discussion on O <sub>2</sub> & CO <sub>2</sub> transport- Regulation of respiration	1 hour



### **Demonstration & Practical**

1.	Practicum on physical examination	2 hours
2.	Practicum on medical history taking and record keeping	2 hours
3.	Assessment of the patient with respiratory failure	2 hours
4.	Lung sounds and heart sounds Simulator based demonstration	4 hours
5.	Dyspnea- clinical presentation	2 hours
6.	Pneumothorax – diagnosis, management.	2 hours
7.	Pleural effusion- clinical presentation	2 hours
8.	Neuromuscular diseases- long term respiratory care	2 hours
9.	Measurement of O <sub>2</sub> delivery, oxygenation	2 hours
10.	BLS Demonstration with manikin	3 hours

#### **Attention: Demonstration & Practical**

- Practical classes will be taken during the clinical postings.
- It is compulsory to attend rotational postings in different clinical areas after the routine theory classes.

THIRD YEAR

PAPER X- APPLIED SCIENCE -2

130 hours

Topic No	Name of the Topic	No of Hours
1.	<b>Gas Physics:</b> States of matter and gas laws, change of state, Gas behavior under changing conditions, Pressure measurement, Gas flows and diffusion, Gas laws, Miscellaneous concepts such as Density and Specific Gravity	2 hours
2.	<b>Gas analyzers</b>	1 hour
3.	<b>Medical gas supply &amp; storage:</b> Compressed gas cylinders, Colour coding, Cylinders and cylinder valves, Cylinder storage, Diameter index safety system, Medical gas pipeline system, Air compressors, Oxygen concentrators, properties of He and NO, Alarms, Safety devices, portable liquid oxygen systems	2 hours
4.	<b>Gas administration devices:</b> Reducing valves, flow meters and regulation of gas pressure and flow, central piping system, selection of device to regulate pressure or flow.	1 hour
5.	<b>Medical gas therapy:</b> Oxygen therapy- goals, clinical practice guidelines, hazards and precautions, O <sub>2</sub> delivery systems, protocol based O <sub>2</sub> therapy approach. Hyperbaric oxygen therapy, Oxygen toxicity. Nitric oxygen therapy, helium oxygen therapy.	4 hours
6.	<b>Humidity therapy:</b> Physiologic control of heat and moisture exchange, Indications for humidification. Humidity producing equipment, types and methods to achieve proper conditioning of gas.	2 hours
7.	<b>Bland aerosol therapy:</b> Aerosol generators, airway appliances for bland aerosol administration.	1 hour
8.	<b>Aerosol drug therapy:</b> Aerosol generators, Factors influencing aerosol deposition in the lungs, Particle deposition, Assessment based aerosol therapy protocols, Infection control.	2 hours
9.	<b>Nebulizers, Metered dose inhalers and DPI's.</b>	1 hour
10.	<b>Artificial airways Part- 1</b> Oro-nasopharyngeal airways, Nasal airways, LMA, Combitubes	1 hour
11.	<b>Artificial airways Part- 2</b> Oral, nasal endotracheal tubes, tracheostomy tubes, special purpose tubes	1 hour
12.	<b>Care of the artificial airway:</b> Long term management, infection control practices, suctioning, cuff management	2 hours
13.	<b>Endotracheal Intubation:</b> Preparing the patient for endotracheal intubation, positioning the patient, awake intubation	1 hour
14.	<b>Difficult airway management</b>	2 hours
15.	<b>Manual Resuscitators &amp; breathing circuit</b>	1 hour

16.	<b>Infection Control:</b> Universal precautions, hand washing, isolation procedures, assure cleanliness of the equipments by selecting or determining appropriate, agent and technique for disinfections or sterilization and monitoring, assure proper handling of biohazard- ous materials, incorporated ventilator associated pneumonia pre- vention, protocol, implementing infectious disease protocol eg.SARS, transmission - prevention	4 hours
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### Diagnostic Techniques:

17.	<b>Electrical conduction system of the heart</b>	1 hour
18.	<b>The normal ECG &amp; standardization of conventional lead positions of 12 lead ECG</b>	1 hour
19.	<b>Cardiac arrhythmias:</b> Sinus arrhythmia, sinus bradycardia, sinus tachycardia, atrial flutter and atrial fibrillation.	1 hour
20.	<b>Cardiac arrhythmias:</b> Premature atrial contractions, junctional rhythms, ventricular arrhythmias, MI, ventricular fibrillation	1 hour
21.	<b>Factors affecting cardiac output-</b> Preload, after load, myocardial contractility, SVR	1 hour
22.	<b>Central venous catheterization:</b> Routes, techniques and uses. Interpretation of data obtained from central venous catheter	1 hour
23.	<b>Pulmonary artery catheterization:</b> Techniques and interpretation of data obtained	1 hour
24.	<b>Arterial line insertion &amp; ABP monitoring:</b> Anatomical locations for insertion, Sampling and procedure of insertion	2 hours
25.	<b>Bedside assessment of pulmonary function:</b> Spirometry, V-T studies, V-F studies, P-V studies.	1 hour
26.	<b>Imaging studies:</b> Values and limitations of chest X-ray Conventional and special radiological views, Chest X-Ray Interpretation. Review of clinical findings and history. Preparation of viewing film. Normal anatomy on chest x-ray. Technical evaluation of chest x-ray. Method of chest x-ray evaluation.	4 hours
27.	<b>Introduction to Pulmonary Diseases and Chest Radiographs</b> Atelectasis, Pneumothorax, Pneumonia, Pulmonary tuberculosis, Occupational lung diseases, Pulmonary edema, COPD, Restrictive lung diseases etc.	2 hours
28.	<b>Blood gas analysis: Interpretation of ABG reports-</b> Status of oxygenation, ventilation, and acid base status. Interpretation of venous blood samples	3 hours
29.	<b>Introduction to PFT lab:</b> Spirometry & history of spirometer, instrumentation, calibration and quality control, infection control, dead space, terms and symbols, volume at ATPS and BTPS.	4 hours
30.	<b>Pulmonary function studies:</b> Spirogram, normal volumes and capacities, lung volume measurement, flow rate measurement, flow volume measurement, closing volume measurement, gas distribution measurement, exercise testing, bronchodilator effectiveness measurement.	4 hours
31.	<b>Interpretation of PFT data</b>	2 hours

## Mechanical Ventilation

32.	<b>History of mechanical ventilation</b>	1 hour
33.	<b>Negative pressure ventilation</b>	
34.	<b>Physical principles of mechanical ventilation:</b> Spontaneous vs positive pressure ventilation Positive vs negative pressure ventilation Power control and systems, Drive mechanisms, variables Pressure generators, flow generators, air oxygen blending systems, delivery circuits.	4 hours
35.	<b>Physiological effects of PPV:</b> Pressure & pressure gradients, effect of MV on different parameters, Minimizing the adverse effects of MV on multiple systems, Complications	2 hours
36.	<b>Respiratory failure and need for mechanical ventilation</b> Physiological measurements of ARF, Type 1 and type 2 RF, Chronic respiratory failure. Assessment of respiratory fatigue, weakness & work of breathing.	3 hours
37.	<b>Indication and assessment of the need for artificial ventilation</b>	1 hour
38.	<b>Initiating and adjusting ventilator settings</b> Initial ventilator settings, adjusting ventilator, oxygenation	2 hours
39.	<b>Selecting a ventilator and the mode:</b> Full and partial ventilator support, mode of ventilation and breath delivery, type of breath delivery, targeting the control variables, Closed loop ventilation strategy, interfacing b/w spontaneous and PPV.	4 hours
40.	<b>Heart lung interactions of during MV</b>	1 hour
41.	<b>Monitoring in Mechanical Ventilation:</b> Initial assessment of patient on MV, documentation, airway pressures, vital signs, examination of the chest, management of the airway, compliance and resistance	2 hours
42.	<b>Non-invasive assessment of respiratory function:</b> Non-invasive measurement of blood gases, indirect calorimetry and metabolic measurements, assessment of respiratory mechanics, hemodynamic monitoring	2 hours

## Demonstration & Practical:

1.	Practicum on assessment of CVS/ vital signs/insertion of invasive lines, sampling maintenance of lines	3 hours
2.	Practicum on clinical laboratory data interpretation/blood gas	2 hours
3.	Practicum and simulations in CPT	2 hours
4.	Practicum and clinical demonstration of suctioning and other airway clearance techniques.	2 hours
5.	Practicum and clinical demonstration of deep breathing exercises	2 hours
6.	Clinical demonstration of BLS (Manikin)	4 hours

7.	Demonstration on O2 delivery devices, oxygen therapy	2 hours
8.	Demonstration – storage of medical gases	2 hours
9.	Clinical postings in gas plant/ demo of colour codings, supply unit	2 hours
10.	Demonstration of regulators and flow meters	2 hours
11.	Demonstration of various humidification systems	2 hours
12.	Demonstration of different aerosol delivery devices Nebulizers, p-MDIs, DPIs, Mesh nebulizers, Ultrasonic nebulizers	2 hours
13.	Transcutaneous monitoring, pulse oxymeter, capnography	2 hours
14.	Demonstration of manual resuscitators & breathing circuits	2 hours
15.	Demonstration of Mechanical ventilators and its internal circuitry	4 hours
16.	Clinical demonstration of effects of PPV on different organs	
17.	Practicum and case discussion on criteria for tracheal intubation and initiation of ventilator support	4 hours
18.	Different postural drainage techniques & airway clearance tech.	2 hours
19.	Demonstration of artificial airways/ airway management technique	4 hours
20.	Demonstration of monitoring of patient on MV	3 hours
21.	Maintenance, cleaning, sterilization of respiratory equipments	2 hours

PAPER XI-BASIC SCIENCE

144 hours

Part- 1

Topic No	Name of the Topic	No of Hours
1.	<b>Medical Ethics &amp; the Relevant Medico-legal Aspects</b> Responsibilities and duties, Ethical behavior & conduct, Medico-legal Aspects its relation to consumer Protection act, Basics of computer application.	3 hours
2.	<b>Ethical and legal implications of practice in Respiratory Care</b>	2 hours
3.	<b>Basics of computer application:</b> MS-windows, MS-word, MS excel, MS-Power point, Data Processing	1 hour
4.	<b>Basics of Medical Statistics:</b> Common statistical terms, Sources and representation of data, Measures of location, Average and percentiles, Measures of central tendency and dispersion, Normal distribution and normal curve, Sampling and probability, Sampling variability and its significance, Significance of difference in mean, Chi-Square test, Designing and methodology of an experiment of a study, Representation of data as tables and graphs, Demography of vital statistics, Standard deviation, P Value and its significance, Recording of data and maintenance of records.	4 hours
5.	<b>Role of statistics in Health science:</b> Introduction to research methodology, health information system, Rate, ratio, incidence, proposition, prevalence, hospital statistics, hypothesis, reliability and validity, correlation.	4 hours
6.	<b>Format of Scientific Documents:</b> Structure of research protocol, structure of thesis/research report, formats of reporting in scientific journals, systemic review of meta analysis	1 hours
7.	<b>Epidemiology</b>	1 hours
8.	<b>Biomedical Waste And its Management</b>	1 hours

9.	<b>Electricity and Electro Medical Equipments and Safe Guards:</b> Basics of Electricity, Functioning of electro medical equipments earthing, Care of apparatus, Static electricity.	2 hours
10.	<b>Intensive care unit and its structure</b>	1 hour

Part 2

### Cardiopulmonary Intensive Care Management

1.	<b>Shock:</b> Hypovolaemic shock, cardiogenic shock, septic shock, ionotropes, vasopressors and diuretics in shock.	2 hours
2.	<b>Acute and chronic renal failure</b>	
3.	<b>Intercostal drainage tubes:</b> Technique of placement, complications, underwater seal systems and its management.	2 hours
4.	<b>Chest trauma:</b> Management of RTA in ICU	1 hour
5.	<b>ACLS:</b> CPR, advanced airway management techniques, diagnosis and management of life threatening arrhythmias, ventilation and electrolyte balance during resuscitation, drugs used in resuscitation, Post resuscitation support	5 hours
6.	<b>Major adult cardiac disorders</b> Concepts in ventilator management, ICU respiratory care Post operative respiratory care of post cardiac surgical patients.	2 hours
7.	<b>Major pediatric cardiac disorders</b> Concepts in ventilator management, ICU respiratory care Post operative respiratory care of post cardiac surgical patients.	4 hours
8.	<b>General pediatric disorders who requires ventilator support</b> Concepts in ventilator management, ICU respiratory care Post operative respiratory care of post cardiac surgical patients	1 hour
9.	<b>Neurological disorders</b> Concepts in ventilator management, ICU respiratory care Post operative respiratory care of post cardiac surgical patients.	1 hours
10.	<b>MV in Congestive heart failure</b>	1 hour
11.	<b>Stroke</b>	1 hour
12.	<b>Renal failure &amp; Haemodialysis</b>	1 hour
13.	<b>Respiratory defense mechanisms</b>	1 hour
14.	<b>Prone ventilation</b>	3 hours
15.	<b>Liquid ventilation &amp; ECMO</b>	1 hours
16.	<b>Bronchoscopy Part 1</b>	2 hours
17.	<b>Sedation and paralysis in Mechanically ventilated patients</b>	1 hours
18.	<b>Ventilator associated pneumonia</b>	1 hours

1.	<b>Two hours practical &amp; clinical demonstration for each topic</b>	36 hours
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### Part 3

#### Neonatal Respiratory Care

1.	<b>Neonatal cardiorespiratory anatomy and physiology</b>	2 hours
2.	<b>Thermoregulation in the newborn</b>	2 hours
3.	<b>Foetal circulation</b>	2 hours
4.	<b>Neonatal respiratory disorders</b>	2 hours
5.	<b>Assessment of adequacy of oxygenation and ventilation</b>	2 hours
6.	<b>Oxygen therapy in neonates</b>	2 hours
7.	<b>CPAP &amp; advanced technologies</b>	2 hours
8.	<b>Initiation of mechanical ventilation in neonates &amp; airway management</b>	4 hours
9.	<b>HFOV &amp; HFV in neonates</b> Initiation criteria, Monitoring assessment and adjustment, how to return to conventional ventilation	3 hours
10.	<b>Weaning and extubation</b>	2 hours
11.	<b>Surfactant replacement therapy</b>	1 hour
12.	<b>Hyaline membrane disease, RDS</b>	2 hours
13.	<b>Periodic breathing and apnea in neonates</b>	1 hour
14.	<b>Bronchopulmonary dysplasia, transient tachypnea of the newborn</b>	1 hour
15.	<b>Neonatal Resuscitation</b>	2 hours

1.	<b>Two hours practicum for each topic.</b>	30 hours
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**Attention:**

**Overall theory hours for Basic Science paper-1 is 80**

**Overall practical and demonstration hours for Basic Science paper-1 is 66**

Topic No	Name of the Topic	No of Hours
1.	<b>Monitoring in mechanical ventilation:</b> Concepts of monitoring, vital Signs, capnography, pulse oxymetry, chest inspection and auscultation, airway pressures etc, fluid electrolyte analysis, Blood gases drawing and interpretation, Transcutaneous blood gas monitoring, methodology assessment and limitations, biomedical engineering aspects.	2 hours
2.	<b>Hemodynamic monitoring:</b> Arterial line insertion, central venous pressure CVP, pulmonary artery catheter and PCWP, cardiac out- put and vascular resistance including calculation, preload after load and contractility assessment, interpretation of mixed venous saturation.	2 hours
3.	<b>Modes of ventilation:</b> conventional modes, dual control modes, APRV, NAVA, Bi Level	2 hours
4.	<b>Positive end expiratory pressure (PEEP) therapy.</b>	2 hours
5.	<b>Ventilator Graphics:</b> volume ventilation with constant flow, pressure ventilation, PSV, P-V loops, F-V loops. Analyzing the ventilation strategy using waveforms	3 hours
6.	<b>Managing ventilator patient:</b> Strategies to improve ventilation, improve oxygenation, acid base electrolyte balance, fluid electro- lyte nutrition balance and management, trouble shooting of ventilator alarms and events	2 hours
7.	<b>Protective lung ventilation strategies</b>	2 hours
8.	<b>Lung recruitment strategies</b>	2 hours
9.	<b>Pathophysiology and management</b>	2 hours
10.	<b>Disease specific applications of mechanical ventilation</b>	4 hours
11.	<b>Independent lung ventilation</b>	1 hour
12.	<b>Percutaneous dilatational tracheostomy</b>	3 hours
13.	Care of the accessories: Care of ventilator circuit, Care of artificial airway, humidification, strategies for preventing infection	1 hour



14.	Pharmacotherapy for mechanical ventilation: Drugs for improving ventilation, steroids, NMBs, sedation, anxiolytics, narcotics	1 hour
15.	Aerosol therapy for a mechanically ventilated patient	1 hour
16.	Weaning of mechanical ventilation: Techniques, evidence based practices in weaning, recommendations, factors for weaning failure, pharmacotherapy during weaning, SBT trials, RSBI, tracheostomy weaning, long term, communication.	3 hours
17.	Withholding and withdrawing ventilator support.	1 hour
18.	Trouble shooting the ventilator	1 hour
19.	Alarms and limits	1 hour
20.	Assessment of outcome of mechanical ventilation	1 hour
21.	Transport of a mechanically ventilated(in hospital & intra hospital)	2 hours
<b>Principles of blood gas analysis</b>		
22.	Basic physical and physiological principles	2 hours
23.	Hydrogen ion regulation in body fluids	1 hour
25.	Acid base balance, Clinical approach to acid base problems, acid excretion, acid base disturbances	2 hours
26.	Quality control in sampling, calibration	1 hour
27.	Correction factors in blood gas	1 hour
28.	Measurement of Hemoglobin and saturation	1 hour
<b>Non-invasive Ventilation</b>		
29.	Equipments for NIV, ventilators, interfaces, accessories	1 hour
30.	Modes of non invasive support	1 hour
31.	Fine tuning of the patient on NIV & synchronization	1 hour
32.	Quality control practices in NIV	1 hour
33.	Pediatric NIV- CPAP, Bubble CPAP etc	1 hour
34.	Disease specific application of non invasive ventilation: COPD, Asthma, OHA, acute respiratory failure, as a weaning tool, CHF, ILD, NMD and quadriplegia.	2 hours
35.	NIV in ICU and HDU, Critical care ventilator vs convention NIV machines.	1 Hours
36.	Care of the patient on NIV- humidification, preventing pressure sores, airway clearance, physiotherapy, weaning from NIV.	1 hour
37.	Home ventilation- Invasive and non-invasive methods	1 hour
38.	Assessment of the home care patient & patient selection criteria	1 hour
39.	Monitoring and complications of NIV	1 hour
40.	Ethical and medico legal aspects of assisted ventilation	1 hour

Topic No	Name of the Topic	No of Hours
1.	Historical perspective of pulmonary rehabilitation	1 hour
2.	Basic concepts of pulmonary rehabilitation	1 hour
3.	PR – definition and characteristics	1 hour
4.	Selection and assessment of chronic respiratory disease patients	2 hours
5.	Therapeutic interventions in PR: Ventilatory muscle training, Nutritional assessment, Preventive aspects for the patient with chronic lung disease, exercise in the rehabilitation of patients with respiratory disease.	2 hours
6.	Tobacco dependence- pathophysiology and management, tobacco cessation program learning objectives.	2 hours
7.	Sleep disorders in pulmonary patients.	2 hours
8.	Educating the patient and family in health management	1 hour
9.	Rehabilitation in the pediatric patients with pulmonary disease.	1 hour
10.	Rehabilitation in non - COPD lung disease	1 hour
11.	Rehabilitation for long term Tracheostomised patient.	1 hour

12.	Bronchoscopy, BAL- Part 2	4 hours
13.	Thoracoscopy	2 hours
14.	Assessment of the patient with respiratory disorder and interpretation of pulmonary function studies	2 hours
15.	Pre-operative pulmonary function studies/ bedside assessments	2 hours
16.	Spirometry- Interpretation of lung volumes	2 hours
17.	Measurement of DLCO	2 hours
18.	Spirometry and body plethysmography.	2 hours
19.	Setting sleep lab	2 hours
20.	Technological advances in the sleep study and its management	2 hours

Total Theory hours: 60
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**Attention:**

One hour practical/demonstration/discussion will be there for all the above topics in pulmonary rehabilitation – **20 hours**

## **Fourth Year – Project and Internship Programme**

### **Description:**

The one-year compulsory internship includes postings at Surgical and medical intensive care units, Pulmonary medicine, Neuro medicine & surgery, Emergency medicine, Neonatology, Operation theaters and rehabilitation centre.

### **Eligibility:**

Candidate who has successfully completed his/her theory and practicals in first three years of Respiratory Therapy programme.

### **Duration:**

One year (compulsory Internship)

## **2.8 Journals**

### **2.9 Logbook**

To be maintained by the candidate and counter signed by the concerned HOD.

#### a) Log Book

A log book has to be maintained by all students and this has to be reviewed by the HOD of the department periodically. Periodic assessment has also to be done in the department by the teachers. Log book is to be submitted at the time of practical examination for perusal by examiners.

#### b) Model of Log Book

### **LOG BOOK OF B.Sc. (RT)**

1. Name.....
2. Roll No.
3. Address

4. Details of Posting: To Be Signed By The Supervising Teacher
5. Participation Conferences – CME Programmes.
6. Details of Leave Availed.
7. Details of Participation in Academic Programmes.
8. Seminars /Symposia Presented
9. Journal Clubs
10. Special Duties (If Any)
11. Miscellaneous
12. Daily Activities Record (Blank Pages)

(Four Page for Each Month X 48 Month Pages)

Signature of Student:

Signature of Supervising Teacher:

Signature of Head of Division/Co-ordinator of the course:

### 3. EXAMINATIONS

#### 3.1 Eligibility to appear for exams

#### 3.2 Schedule of Regular/Supplementary exams

Paper Code	Subject Name
First Year	
I	Anatomy
II	Physiology
III	Biochemistry
IV	Microbiology
V	Community Medicine
Second Year	
VI	Clinical Psychology

VII	Applied Pathology
VIII	General and Applied Pharmacology
IX	Applied Science I
Third Year	
X	Applied Science II
XI	Basic Sciences
XII	Applied Science III
XII	Pulmonary Rehabilitation
Fourth year	
XIII	Project +Viva

### 3.3 Scheme of examination

Paper Code	Subject Name	Theory				Aggregate	
		University	Internal	Oral	Subject Total		
<b>FIRST YEAR</b>							
I	Anatomy	70	10	20	100	1400	
II	Physiology	70	10	20	100		
III	Biochemistry	70	10	20	100		
IV	Microbiology	70	10	20	100		
V	Community Medicine	70	10	20	100		
<b>SECOND YEAR</b>							
VI	Clinical Psychology	70	10	20	100		
VII	Applied Pathology	70	10	20	100		
VIII	General and Applied Pharmacology	70	10	20	100		
IX	Applied Science I	70	10	20	100		
<b>THIRD YEAR</b>							
XI	Basic Sciences	70	10	20	100		
X	Applied Science II	70	10	20	100		
XII	Applied Science III	70	10	20	100		
XII	Pulmonary Rehabilitation	70	10	20	100		
Fourth Year							
XIII	Project +Viva	-	-	-	100		

### 3.4 Papers in each year

See clause 2.6 and clause 3.3

### 3.5 Details of theory examinations

See clause 2.6

### 3.6 Internal assessment component

Sl. No	Items	Maximum. Marks	Split up
1	Attendance	5	96% and above - 5 marks 92.1% – 95.9% - 4 marks 88.1% – 92% - 3marks 84.1% – 88% - -2marks 80% - 84% - 1mark
2	Assignments	20	Must be handwritten. Valuation is based on content, presentation, and originality. Plagiarism will not be accepted and treated seriously and those assignments will be rejected.
4	Class tests	25	The affiliated colleges shall conduct at least three internal examinations/tests in each subject. Marks in best out of 2 examinations shall be taken for internal assessment. However model examination is mandatory to conduct.
TOTAL		50	

### **3.7 Details of practical/clinical practicum exams**

See clause 3.3

### **3.8 Details of viva voce: division of marks**

See clause 3.3

