

PONDICHERRY UNIVERSITY

Puducherry



Regulations and Syllabus

Bachelor of Science (Cardiac Technology)

B.Sc. (CT)

2022-2023

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Bachelor of Science in Cardiac Technology

I. Aim

The aim of the undergraduate Cardiac Technology program is to prepare graduates who are well versed – in techniques such as Cardiac catheterization, Electrocardiography, Echocardiography and Ultrasound. Graduates will integrate knowledge and skills of Cardiac Technology to provide health care solutions for the benefit of the society.

II. Objectives

On completion of B.Sc. Cardiac Technology program, the graduates will be able to:

- evolve into a fully trained, qualified Cardiac Technologist capable of working independently.
- integrate knowledge and skills of Cardiac Technology to provide healthcare solutions for the benefit of the society.
- utilize the latest trends and technology in providing cardiac care.
- assess the clients for heart-related problem
- monitor and care for those suffering from cardiovascular ailments
- have good knowledge in medical equipment and tools used.
- observe and understand the correct way of performing cardiac procedures before practising them.
- assist Cardiologist in techniques such as Cardiac catheterization, Electrocardiography, Echocardiography and Ultrasound.
- learn and apply basic and advanced life support skills
- work in a team with Cardiologists and Cardiac Surgeons in a high-pressure hospital environment.
- conduct needs-based research studies in various settings and utilize the research findings to improve the quality of care.
- practice within code of ethics and professional conduct and acceptable standards of cardiac practices with the legal boundaries.

III. Program outcome

- At the end of B.Sc. Cardiac Technology program the graduates are prepared to take up the clinical assessment, decision making skills and management for a range of cardiac conditions including pharmacological and non-pharmacological therapeutic interventions, assist in diagnosis and treatment of cardiac and peripheral vascular conditions and to prepare patients for open-heart surgery and implantation of pacemakers.

IV. Regulations

1. Eligibility for Admission

- The admission is based on the CENTAC process. The reservation and other process in as per the Govt norms from time to time. Candidates should have completed a minimum of 17 years of age as on 31st December of the year of admission. The upper age limit is 25 years. (Relaxation up to 5 years for SC/ST candidate and up to 3 years for MBC/OBC candidates.)
- Candidates should have completed a minimum of 17 years of age as on 31st December of the year of admission. The upper age limit is 25 years. (Relaxable upto 5 years for SC/ST candidate and upto 3 years for MBC/OBC candidates.)
- Candidates should have a pass in the Higher Secondary Examination conducted by Board of Higher Secondary Examination of Tamil Nadu, or any other equivalent examination accepted by the University, there to with a minimum of 50% marks (40% for SC, ST, MBC, OBC the candidates) in aggregate of the Science subjects (Physics, Chemistry, Biology/ Botany & Zoology) and should have English as one of the subjects.
- Candidate shall be medically fit to undergo the Cardiac Technology Program.
- **For Lateral entry:** Diploma in Cardiac Care Technology / Diploma in ECHO Cardiac Technology courses approved by the Government after completing 12th Class / 10 +2 of CBSE or equivalent with minimum aggregate of 50% marks in Physics, Chemistry and Biology provided the candidate as passed in each subject separately. The age limit is 35 years. The Government service candidates will be exempted if approved by the committee or the Government.
- **Provision of lateral entry:** lateral entry to second year for B.Sc Cardiac Technology program for candidates who have passed diploma program in Dialysis Technology from the Government Boards and recognized by State / Central University, full filling the conditions specified and these students are eligible to take admission on lateral entry system only if the same subject have been studies at 10+2 scheme and diploma level. The admission process is as per the Government rule and regulations from time to time. Students to be admitted under lateral entry shall be 10% over and above the sanctioned intake.
- The lateral entry candidates have the direct entry into the second year (i.e from III semester) are exempted from the I year (Semester I and II) curriculum. For the grant of the university degree the lateral entry candidate have to complete the semester III to semester VI, and the internship compulsory and mandatory.

2. Duration of the Program

The duration of the program shall be *Three years / Lateral entry two years* of full-time study and *One year* of compulsory rotatory internship.

3. Medium of Instruction

- English shall be the medium of instruction for all the subjects of study and for the examinations of the Program.

4. Program detail

- The program detail is shown in Table I.
- *The detailed syllabus in respect of the program is appended to this regulation.*

5. Attendance required for appearing examination

- Examination will be conducted in both theory and practical, as prescribed.
- Candidates will be permitted to appear for the University Examination in the subject only if they secure not less than 80% attendance (irrespective of the kind of absence) in each subject of that semester.
- Condonation of shortage of attendance in aggregate upto 10% in each semester may be granted by the College Academic Committee and as per regulations of University. For Students internship offered during VII and VIII semesters, 100% attendance is compulsory. However, the students may be condoned upto 15%, under extraordinary situation, by the dean based on the genuineness of the case upon the recommendation of the concern program teaching and Head of the Department.
- The students failing to attend classes/examinations on non-official ground will be treated as absent. Student deputed for Sports, Cultural Meets, etc with prior permission of Principal / Dean of the College shall be given attendance for the period of absent.
- However, Students under the category must have attended a minimum of 50% classes in the total Theory and Practical Classes conducted.

6. Internal Assessment

- Internal assessment will be done in each subject of study and the marks will be awarded to the candidates as detailed in the scheme of examinations.
- The marks awarded will be on the basis of candidate's performance in the assignments, class tests, laboratory work, preparation and presentation of seminars and clinical cases.
- The marks secured by the candidate during each semester in each subject shall be forwarded to the University at the end of the semester, i.e., before the commencement of the written examination.

7. Examinations

- The University Examinations will be conducted in semester pattern for all the three years, each year consisting of two semesters.
- The particulars of subjects for various examinations and distribution of marks are shown separately in the Table II & III.
- The examination for the main subjects will be conducted by the University and for the non-examination subjects by the college.
- The maximum number of candidates for practical examination should not exceed 20 per day.
- One internal and one external examiner should jointly conduct practical examination for each student.
- An examiner should not be below the rank of an Assistant Professor or Tutor/Demonstrator.

8. Passing minimum

- Candidate has to pass separately in theory + Viva voce and Practical by getting a minimum of 50% marks in combined internal assessment and University examination. A candidate should secure 50% of the marks in theory and 50% in practical (wherever prescribed)
- If a candidate fails in either theory or practical, he/she has to re-appear for both theory and practical.
- A candidate should secure 50% of total marks in the test conducted by the college for the non-examination subject.

9. Procedure for passing the Program

- The maximum period to complete the program successfully should not exceed a period of eight years.

10. Internship

- There shall be a compulsory full-time rotatory Internship after the candidate having passed all the subjects prescribed in the scheme of examination.
- The Internship should be done for a period of one year, in an Institution/ Hospital approved.
- No candidate shall be eligible for the award of the degree without successfully completing one-year internship.

Desirable:

- A Research study to be done and submit the report before the one year of Internship.
- One or more value added courses (like Swayam) during final year or Internship.

11. Eligibility for award of degree

- The candidates shall be eligible for the *Degree of Bachelor of Cardiac Technology / Lateral entry* when they have undergone the prescribed Program of study for a *period of three years / two years* in an institution approved by the University and *have passed the prescribed examinations in all subjects* and *have completed a compulsory internship over a period of one year* in an approved institution.

12. Declaration of Class

- A successful candidate obtaining **75% and more marks** in the grand total aggregate in the *First attempt* shall be declared to have passed these subjects with **Distinction**.
- A successful candidate obtaining **60% and more but less than 74.9% marks** in the grand total aggregate in the *First attempt* shall be declared to have passed with **First Class**.
- A successful candidate obtaining **50% and more but less than 59.9% marks** in the grand total aggregate in the *First attempt* and the candidate who *passed with more than one attempt* irrespective of the percentage of marks secured shall be declared to have passed these subjects with **Second Class**.
- Ranks shall be declared on the basis of the aggregate marks obtained by a candidate in the University examination subjects of the program.
- Only those candidates who *have passed all the subjects in all examinations in the First attempt* shall be eligible for the **Award of rank**

V. Program Structure- Cardiac Technology

Table - I

Year	Sem	S.No	Subject	Theory Hrs	Practical Hrs	Clinical Hrs	Total Hrs
I Year	I Sem	1.	Anatomy	60	30		90
		2.	Physiology	60	30		90
		3.	Biochemistry	60	30		90
		C 1	Communication and Soft Skills	60			60
			Library/Co-curricular	30			30
			Clinical Hours			140	140
			Total Hours	270	90	140	500
	II Sem	4.	Pathology	60	30		90
		5.	Microbiology	60	30		90
		C 2	Computer Application	30	30		60
		C 3	First Aid	30	30		60
			Library/Co-curricular	30			30
			Clinical Hours			270	270
			Total Hours	210	120	270	600
			I Year Overall Total	480	210	410	1100
II Year	III Sem	6.	Applied Anatomy & Physiology related to Cardiac Technology	60		320	380
		7.	Applied Pharmacology	60		100	160
		C 4	Sociology	30			30
			Library/Co-curricular	30			30
			Total Hours	180		420	600
	IV Sem	8.	Introduction to Cardiac Technology	60		320	380
		9.	Medical Disorders Relevant to Cardiac Technology	60		100	160
		C 5	Environmental Science	30			30
			Library/Co-curricular	30			30
			Total Hours	180		420	600
			II Year Overall Total	360		490	1200
III year	V Sem	10.	Cardiac Technology Applied - I	60		230	290
		11.	Cardiac Technology Applied - II	60		190	250
		C 6	Medical Ethics	30			30
			Library/Co-curricular	30			30
			Total Hours	180		420	600
	VI Sem	12.	Advance Cardiac Technology - I	60		150	210
		13.	Advance Cardiac Technology - II	60		270	330
		C 7	Research Methodology & Bio-Statistics*	30			30
			Library/Co-curricular	30			30
			Total Hours	180		420	600
			III Year Overall Total	360		840	1200
IV year			Internship				1 year

Note: C 1 to C 7 - Subsidiary Subjects

Internship Details (1 year)

S.No	Clinical Area	In Months
1.	Cath lab	3 Months
2.	ECHO	3 Months
3.	ECG/Tread mill	3 Months
4.	Operation Theatre (CABG)	1 Month
6.	Intensive Coronary Care Unit	2 Months
	Total	12 Months

VI. Scheme of Examination with mark details

Table II

Duration: 3 Hours

Sem	S.No	Subject	University marks		Internal Marks		Viva		Total		Total theory + Practical	
			Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
I Sem	1.1.1	Anatomy	80	32	25		20	10	125	63	200	100
	1.1.2	Anatomy - Practical	50	25	25				75	37		
	1.1.3	Physiology	80	32	25		20	10	125	63	200	100
	1.1.4	Physiology - Practical	50	25	25				75	37		
	1.1.5	Biochemistry	75	30	25				100	50	100	50
	*1.1.6	Communication and soft skills			50	25			50	25	50	25
II Sem	1.2.1	Applied Pathology	80	32	25		20	10	125	63	200	100
	1.2.2	Applied Pathology - Practical	50	25	25				75	37		
	1.2.3	Applied Microbiology	80	32	25		20	10	125	63	200	100
	1.2.4	Applied Microbiology - Practical	50	25	25				75	37		
	*1.2.5	Computer Application			50	25			50	25	50	25
	*1.2.6	First Aid			50	25			50	25	50	25
III sem	2.3.1	Applied Anatomy and Physiology related to Cardiac Technology	75	30	25				100	50	100	50
	2.3.2	Applied Pharmacology	75	30	25				100	50	100	50
	*2.3.3	Sociology			50	25			50	25	50	25
IV sem	2.4.1	Introduction to Cardiac Technology	80	32	25		20	10	125	63	200	100
	2.4.2	Introduction to Cardiac Technology - Practical	50	25	25				75	37		
	2.4.3	Medical disorder relevant to Cardiac Technology	75	30	25				100	50	100	50
	*2.4.4	Environmental Science			50	25			50	25	50	25
V sem	3.5.1	Cardiac Technology Applied - I	75	30	25				100	50	100	50
	3.5.2	Cardiac Technology Applied - II	80	32	25		20	10	125	63	200	100
	3.5.3	Cardiac Technology Applied - Practical	50	25	25				75	37		
	*3.5.4	Medical Ethics			50	25			50	25	50	25
VI sem	3.6.1	Advance Cardiac Technology -I	75	30	25				100	50	100	50
	3.6.2	Advance Cardiac Technology -II	80	32	25		20	10	125	63	200	100
	3.6.3	Advance Cardiac Technology - Practical	50	25	25				75	37		
	*3.6.4	Research Methodology & Bio-statistics			50	25			50	25	50	25

* Subsidiary Subjects only Internal Exam

VII. Course Description

1. Anatomy

Placement: I Year (I Semester)

Time: Theory: 60 Hours
Practical: 30 Hours (Lab)

Course Description: The course is designed to assist students to acquire comprehensive knowledge of the normal structure of human body, to facilitate understanding of anatomical basic health, identify alteration in structure with emphasis on clinical application to practice.

Course Outline

Unit	Time (Hrs)	Content
I	15	Introduction to anatomy terms and organizations of the human body <ul style="list-style-type: none">• Introduction to Anatomical terms relative to position - anterior, ventral, posterior dorsal, superior, inferior, median, lateral, proximal distal superficial, deep, prone, supine, palmar and planter• Anatomical planes (axial/ transverse /horizontal, sagittal /vertical plane and coronal/ frontal/ oblique plain)• Movement (flexion, extension, abduction, adduction, medial, rotation lateral rotation, inversion, eversion, supination, pronation, plantar flexion, dorsi flexion and circumduction)• Cell structure, cell division• Tissues – Definition, types, characteristic, classification, location• Membranes and glands -classification and structures• Identify major surface and body landmarks in each body region organization of human body• Hyaline, fibro cartilages elastic cartilages• Features of skeletal, smooth and Cardiac muscles
II	13	The Circulatory and Lymphatic system <ul style="list-style-type: none">• Position of heart related to Associated structures• Chambers of heart, layers of heart• Structures of blood components, anterior and venous system• Nerve supply to and blood supply to heart• Veins used for IV injections• Lymphatic tissues
III	4	The Digestive system <ul style="list-style-type: none">• Structures of alimentary canal and organs of digestion
IV	4	The Respiratory system <ul style="list-style-type: none">• Structures of organ of Respiration• Muscles of Respiratory System
V	3	The Endocrine System <ul style="list-style-type: none">• Structures of hypothalamus, Pineal gland, Pituitary gland, Thyroid Parathyroid, Thymus, Pancreas and Adrenal gland.

Unit	Time (Hrs)	Content
VI	3	The Sensory organ <ul style="list-style-type: none"> Structures of skin, eyes, ears, nose and tongue.
VII	4	The Musculo Skeletal System Muscular Systems <ul style="list-style-type: none"> Types and structures of muscles Muscle groups - Muscles of head, neck, thorax, abdominal, pelvis upper and lower Limb Principles of Muscles – deltoid, biceps, triceps, respiratory, abdominal, pelvic floor muscles gluteal muscle and vastus laterals Major muscles involved in procedure Skeletal System <ul style="list-style-type: none"> Anatomical position Bones - type, structures, growth and ossification Axial and appendicular skeleton Joints – Classification, major joints and structures
VIII	4	The Nervous Systems <ul style="list-style-type: none"> Review and structures of neurons Central Nervous system, Autonomic Nervous system, and Peripheral Nervous system Structures of brain, spinal cord, cranial nerve, spinal nerves, functional areas of cerebral cortex Ventricles of the brain- formation, circulation and drainage
IX	4	The Renal System <ul style="list-style-type: none"> Structures of Kidney, Ureters, bladder, urethra
X	4	The Reproductive System <ul style="list-style-type: none"> Structures of Male Reproductive Organs Structures of Female Reproductive Organs Structures of Breast
XI	2	Anatomical Techniques Basic principles of Karyotyping.

Practical's:

- Histology of Types of Epithelium
- Histology of Serous, Mucous and Mixed Salivary gland
- Histology of the types of Cartilage
- Demo of all bones showing parts, radiographs of normal bones & Joints
- Histology of Skeletal (TS & LS), Smooth and Cardiac muscle
- Demonstration of Heart and Vessels of the body
- Histology of Large artery, Medium sized artery and vein, Large Vein
- Microscopic appearance of Large and Medium sized Artery and Vein, Large Vein

- Demonstration of all muscles of the body
- Pericardium
- Histology of Lymph node, Spleen, Tonsil and Thymus
- Demonstration of parts of Respiratory system
- Normal Chest radiograph showing Heart shadows
- Histology of Lung and Trachea
- Normal Angiograms
- Histology of Lymphatic tissues
- Radiographs of Abdomen – IVP, Retrograde cystogram
- Demonstration of parts of the Urinary system and Histology of Kidney, Ureter and Urinary bladder
- Demonstration of Male and Female Pelvis with organs in situ.
- Histology of Male and Female Reproductive organs
- Histology of Pituitary, Thyroid, parathyroid and Suprarenal glands
- Histology of peripheral nerve and optic nerve.
- Demo of all parts of brain.

Reference Books:

1. Inderbir Singh, Textbook of Anatomy, Jaypee, 7th Edi, Vol I to III, 2019
2. Chaurasia, Human Anatomy, CBS Publisher, 5th Edi, Vol 1 to 3, 2010.
3. Ross and Wilson Anatomy and Physiology in Health and illness, Elsever, 13th Edi, 2018.

Examination Pattern

Theory exam: (one paper)	80 marks
Practical exam	50 marks
Oral exam	20 marks
Internal assessment (Theory)	25 marks
Internal assessment (Practical)	25 marks

	200 marks

Duration

3 hours
3 hours

The practical examination will have the following components

Identification of Gross Spotters (General)	25 marks
Identification of Gross Spotters (CVS / Throat)	25 marks

50 marks

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 80 marks in such a way that the question paper shall contain
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Distribution of Course Content**80 marks**

1. General Anatomy
2. Anatomy of cardiovascular system
3. Systemic Anatomy

Pattern of Question Paper:**Section A:**

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	8 X 5 = 40 marks
Very Short answer	-	10 X 2 = 20 marks

2. Physiology

Placement: I Year (I Semester)

Time: Theory: 60 Hours

Practical: 30 Hours (Lab)

Course Description: The course is designed to assist students to acquire comprehensive knowledge of the normal functions of the organ systems of the human body to facilitate understanding of physiological basis of health, identify alteration in functions and provide the student with necessary physiological knowledge to practice.

Course Outline

Unit	Time (Hrs)	Content
I	4	General Physiology – Basic concepts <ul style="list-style-type: none">• Cell physiology including transportation across cell membrane• Body fluid compartments, Distribution of total body fluid, intracellular and extracellular compartments, major electrolytes and maintenance of homeostasis• Cell cycle• Tissue – formation, repair• Membranes and glands – functions
II	6	Respiratory system <ul style="list-style-type: none">• Functions of respiratory organs• Physiology of respiration• Pulmonary circulation – functional features• Pulmonary ventilation, exchange of gases• Carriage of oxygen and carbon-dioxide,• Exchange of gases in tissue• Regulation of respiration• Hypoxia, cyanosis, dyspnea, periodic breathing• Respiratory changes during exercise
III	8	Digestive system <ul style="list-style-type: none">• Functions of the organs of digestive tract• Saliva – composition, regulation of secretion and functions of saliva• Composition and functions of gastric juice, mechanism and regulation of gastric secretion• Composition of pancreatic juice, functions, regulation of pancreatic secretion• Functions of liver, gall bladder and pancreas• Composition of bile and functions• Secretion and functions of small and large intestine• Movements of alimentary tract• Digestion in mouth, stomach, small intestine, large intestine, absorption of food

Unit	Time (Hrs)	Content
IV	6	Circulatory and Lymphatic system <ul style="list-style-type: none"> • Functions of heart, conduction system, cardiac cycle, Stroke volume and cardiac output • Blood pressure and Pulse • Circulation – principles, factors influencing blood pressure, pulse • Coronary circulation, Pulmonary and systemic circulation • Heart rate – regulation of heart rate • Normal value and variations • Cardiovascular homeostasis in exercise and posture
V	5	Blood <ul style="list-style-type: none"> • Blood – Functions, Physical characteristics • Formation of blood cells • Erythropoiesis – Functions of RBC, RBC life cycle • WBC – types, functions • Platelets – Functions and production of platelets • Clotting mechanism of blood, clotting time, bleeding time, PTT • Homeostasis – role of vasoconstriction, platelet plug formation in hemostasis, coagulation factors, intrinsic and extrinsic pathways of coagulation • Blood groups and types • Functions of reticuloendothelial system, immunity
VI	5	The Endocrine system <ul style="list-style-type: none"> • Functions and hormones of Pineal Gland, Pituitary gland, Thyroid, Parathyroid, Thymus, Pancreas and Adrenal glands. • Other hormones • Endocrine Alterations in diseases
VII	4	The Sensory Organs <ul style="list-style-type: none"> • Functions of skin • Vision, hearing, taste and smell • Errors of refraction, aging changes
VIII	6	Musculoskeletal system <ul style="list-style-type: none"> • Bones – Functions, movements of bones of axial and appendicular skeleton, Bone healing • Joints and joint movements • Joint diseases • Properties and Functions of skeletal muscles – mechanism of muscle contraction • Structure and properties of cardiac muscles and smooth muscles
IX	4	Renal system <ul style="list-style-type: none"> • Functions of kidney in maintaining homeostasis • GFR • Functions of ureters, bladder and urethra • Micturition • Regulation of renal functions

Unit	Time (Hrs)	Content
X	4	The Reproductive system <ul style="list-style-type: none"> Female reproductive system – Menstrual cycle, function and hormones of ovary, oogenesis, fertilization, implantation, Functions of breast Male reproductive system – Spermatogenesis, hormones and its functions, semen
XI	8	Nervous system <ul style="list-style-type: none"> Overview of nervous system Review of types, structure and functions of neurons Nerve impulse Review functions of Brain-Medulla, Pons, Cerebrum, Cerebellum Sensory and Motor Nervous system Peripheral Nervous system Autonomic Nervous system Limbic system and higher mental Functions - Hippocampus, Thalamus, Hypothalamus Vestibular apparatus Functions of cranial nerves Autonomic functions Physiology of Pain-somatic, visceral and referred Reflexes CSF formation, composition, circulation of CSF, blood brain barrier and blood CSF barrier

Practical's :

- Hemoglobinometry
- White Blood Cell Count
- Red Blood Cell Count
- Determination of Blood Groups
- Leishman's Staining and Differential WBC Count
- Determination of Packed Cell Volume
- Erythrocyte Sedimentation Rate (ESR)
- Determination of Clotting Time, Bleeding Time
- Recording of Blood pressure
- Auscultation for Heart sounds
- Artificial Respiration
- Determination of Vital capacity.

Reference Books :

1. Sembulingam (K), Essentials of Medical Physiology, Jaypee, 8th Edi, 2019.
2. Guyton & Hall, Textbook of Medical Physiology, Elsevier, 2nd Edi, 2018.
3. Pal (GK), Comprehensive Textbook of Medical Physiology, Jaypee, 2nd Edi, Vol I & II, 2019.
4. Surinder Singh, Principles of Human Physiology for Course in Nursing & Allied Health Sciences, CBS, 2017.
5. Ross and Wilson Anatomy and Physiology in Health and illness, Elsevier, 13th Edi, 2018.

Examination Pattern

Theory exam: (one paper)

80 marks

Duration

3 hours

Practical exam

50 marks

3 hours

Oral exam

20 marks

Internal assessment (Theory)

25 marks

Internal assessment (Practical)

25 marks

200 marks

The practical examination will have the following components

Practical Major

20 marks

Practical Minor

10 marks

Spotters

20 marks

50 marks

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 80 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Distribution of Course Content

80 marks

Nerve, muscle, blood, kidney, GI tract, endocrines and reproduction

Cardio vascular system, respiratory system, central nervous system and special sense

Pattern of Question Paper:

Section A:

Long answer question

- 2 X 10 = 20 marks

Short answer question

- 8 X 5 = 40 marks

Very Short answer

- 10 X 2 = 20 marks

3. Biochemistry

Placement: I Year (I Semester)

Time: Theory: 60 Hours
Practical: 30 Hours(Lab)

Course Description: The course is designed to assist the students to acquire knowledge of the normal biochemical composition and functioning of human body, its alterations in disease conditions and to apply this knowledge in to practice.

Course Outline

Unit	Time (Hrs)	Content
I	3	Introduction to Biochemistry
II	3	Biophysical aspect of Biochemistry
III	7	Carbohydrates <ul style="list-style-type: none">• Chemistry of carbohydrates, Classification and biological importance• Digestion and absorption, Glycolysis, glycogen metabolism, glucono-genesis, TCA cycle• Regulation of blood glucose, Diabetes mellitus
IV	7	Proteins <ul style="list-style-type: none">• Biological importance, Classification of amino acids & proteins• Digestion and absorption• Urea synthesis, Transamination
V	7	Lipids <ul style="list-style-type: none">• Biological importance• Classification of lipids, lipoproteins, Overview of lipid metabolism
VI	6	Enzymes <ul style="list-style-type: none">• Classification, Factors affecting enzyme action• Enzyme inhibition & Chemical enzymology
VII	7	Endocrinology <ul style="list-style-type: none">• Hormones, Role of biological important hormones• Pituitary, thyroid, adrenal cortex and medulla• Sex hormones
VIII	7	Mineral metabolism <ul style="list-style-type: none">• Regulation of blood level• Consequences of excess and deficiency of calcium, Phosphate, iron, copper & zinc
IX	7	Vitamin <ul style="list-style-type: none">• Fat soluble vitamins, Water soluble vitamins• Biochemical function, Deficiency, Manifestation, Source & RDA
X	6	Clinical Biochemistry <ul style="list-style-type: none">• LFT, RFT• Urine analysis

Practical's:

- Simple Color reactions of Carbohydrates and Proteins
- Qualitative estimations of Glucose, Urea, Creatinine, Total Protein and Cholesterol
- Normal constituents of Urine
- Abnormal (pathological) Urine
- Glucose Tolerance Test and its significance
- Demonstration of Electrophoresis and Interpretation of important clinical conditions based on Electrophoresis appearance
- Demonstration of Paper Chromatography and its utility in the diagnosis of inborn errors of metabolism.

Reference Books :

1. Vasudevan (DM), Text Book of Biochemistry for Medical Students, Jaypee Pub, 9th Edi, 2019.
2. Wilson & Walkers Principles & Techniques of Biochemistry & Molecular Biology, University Press, 8th Edi, 2018.
3. Harbans Lal and Rajesh Pandey Textbook of biochemistry, CBS, 3rd Edi, 2017
4. Harold Varley, Practical Clinical Biochemistry, CBS, 4th Edi, 2010.

Examination Pattern

Theory exam:

75 marks

Internal assessment (Theory)

25 marks

100 marks

Duration

3 hours

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 75 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Pattern of Question Paper:

Long answer question

- 2 X 10 = 20 marks

Short answer question

- 7 X 5 = 35 marks

Very Short answer

- 10 X 2 = 20 marks

C 1. Communication and Soft skills

Placement: I Year (I Semester)

Time: Theory: 60 Hours

Course Description: The course is designed to enable students to enhance their ability to speak and write the language (and use English) required for effective communication in their professional work. Students will practice their skills in verbal and written English during clinical and classroom experience.

Course Outline

Unit	Time (Hrs)	Content
I	10	Review of Grammar <ul style="list-style-type: none"> Remedial study of Grammar Building Vocabulary Phonetics Public Speaking
II	3	Communication <ul style="list-style-type: none"> What is communication? What are communication roles of listeners, speakers, readers and writers as healthcare professionals?
III	5	Introduction to LSRGW <ul style="list-style-type: none"> L – Listening: Different types of listening S – Speaking: Understanding Consonants, Vowels, Word and Sentence Stress, Intonation R – Reading: Medical vocabulary Gr – Grammar: Understanding tenses, linkers W – Writing simple sentences and short paragraphs – emphasis on correct grammar
IV	7	Attentive Listening <ul style="list-style-type: none"> Focusing on listening in different situations, announcements, descriptions, narratives, instructions, discussions, demonstrations Reproducing Verbatim Listening to academic talks/ lectures Listening to presentation
V	12	Speaking – Effective Conversation <ul style="list-style-type: none"> Conversation situations – informal, formal and neutral Factors influencing way of speaking – setting, topic, social relationship, attitude and language Greetings, introductions, requesting, asking for and giving permission, speaking personally and casual conversations Asking for information, giving instructions and directions Agreeing and disagreeing, giving opinions Describing people, places, events and things, narrating, reporting & reaching conclusions Evaluating and comparing Complaints and suggestions Telephone conversations Delivering presentations

Unit	Time (Hrs)	Content
VI	8	Reading <ul style="list-style-type: none"> • Reading strategies, reading notes and messages • Reading relevant articles and news items • Vocabulary for everyday activities, abbreviations and medical vocabulary • Understanding visuals, graphs, figures and notes on instructions • Reading reports and interpreting them • Using idioms and phrases, spotting errors, vocabulary for presentations • Remedial Grammar
VII	7	Writing Skills <ul style="list-style-type: none"> • Writing patient history • Note taking • Summarizing • Anecdotal records • Letter writing • Diary/Journal writing • Report writing • Paper writing skills • Abstract writing
VII	8	LSRW Skills <ul style="list-style-type: none"> • Critical thinking strategies for listening and reading • Oral reports, presentations • Writing instructions, letters and reports • Error analysis regarding LSRW

Reference Books:

1. Clement, I, Essentials of English for Paramedical Courses, EMMESS, 2nd Edi, 2018.
2. Lakshminarayanan K.R., English for Technical Communication, Scitech publication, 2nd Edi 2015

4. Applied Pathology

Placement: I Year (II Semester)

Time: Theory: 60 Hours
Practical: 30 Hours(Lab)

Course Description: The course is designed to understand pathology laboratory reports, the normal ranges of investigations, severity and specificity of disease conditions which will help to perform International Classification of diseases to clinical pertinence.

Course Outline

Unit	Time (Hrs)	Content
I	3	Basic Concepts in Cellular Adaption's Cell injury and Cell death Cellular response to stress and other stimuli Over view of Cell injury and Cell death
II	5	Basic Principles in Inflammatory Process General features including inflammatory mediators and Basic Mechanisms of disorders of Immunity, General features of the immune system, Disorders of the Immune System, Acute and Chronic inflammation
III	5	Infectious Diseases Infectious diseases, Bacterial Infections (Typhoid, Tuberculosis and Leprosy) Viral infections (HIV, HbSAg and Polio) Specific Examples of Fungal, Parasitic and Syphilis infections
IV	3	Neoplasia Nomenclature, Rudimentary aspects on Tumor growth and Metastasis Definition of Neoplasia, Differences between Benign and Malignant tumors Staging and Grading of Tumors (Basic Aspects), Oncogenes and Tumor Suppressor genes
V	5	Hematology Structure and functions of Formed elements Objective use of anticoagulants, Mechanisms of Hemostasis Tests to monitor Coagulation, Blood Grouping and Blood Bank (Basic aspects on Blood Components) Fixatives and Basic details in Cytology, Aspiration Cytology of Bone marrow Basic concepts in Anemia, Cellular aspects of Leukemia (Basic Concepts)
VI	3	Histopathology Use of Microscopes, Grossing and Mounting Techniques Processing of Biopsy specimen, Paraffin sections
VII	3	Biomedical Waste Management and Environmental Pathology Biomedical waste management from perspectives of Pathology Environment and Disease – Smoking hazards, Asbestosis and Silicosis & Occupational Exposure
VIII	3	Clinical Pathology Collection, transport, preservation and processing of Clinical Specimen Clinical Pathology of specialized Body Fluids (CSF), Synovial fluid, Pleural Fluid Urine Examination (Urinalysis)

Unit	Time (Hrs)	Content
IX	20	Overview of Systemic Pathology Rheumatic Heart Disease Lungs: Pneumonia, COPD, Asthma, ARDS Liver: Hepatitis, Cirrhosis Muscle: Myasthenia Gravis Brain: Meningitis, Aspergillosis, CNS Tumor – (Classification)
X	10	Practical Demonstration Demo of Coagulation Profile, Phlebotomy techniques Blood Grouping and Rh typing, Urine Routine, Hemogram, Fecal Examination Safety Precautions in Clinical Pathology

Practical's:

- Blood Grouping and Rh typing
- Urine Routine
- Hb, TLC, DLC
- Gross Specimens
- Slides

Reference Books :

1. Mohan (H), Textbook of Pathology, Jaypee Pub, 5thEdi, 2019.
2. Kumar, Robbins & Cotran Pathologic Basis of Disease, WB Saunders, 10thEdi, 2020.
3. Kawthalkar(S), Essentials of Clinical Pathology, Jaypee Brothers, 2nd edi, 2018.
4. Nayak (R), Essentials of Hematology & Clinical Pathology, Jaypee Brothers, 2nd Edi, 2017.
5. Sengupta, Synopsis of Clinical Pathology & Microbiology, CBS Pub, 8th Edi, 2017.

Examination Pattern (Subject with Theory & Practical Exam)

Theory exam:	80 marks
Practical exam	50 marks
Oral exam	20 marks
Internal assessment (Theory)	25 marks
Internal assessment (Practical)	25 marks

Duration

3 hours
3 hours

200 marks

The practical examination will have the following components

Hb estimation	5 marks
Urine examination	20 marks
Blood grouping	5 marks
Spotter / chart	20 marks

50 marks

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 80 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Pattern of Question Paper:**Section A:**

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	8 X 5 = 40 marks
Very Short answer	-	10 X 2 = 20 marks

5. Applied Microbiology

Placement: I Year (II Semester)

Time: Theory: 60 Hours

Practical: 30 Hours (Lab)

Course Description : The course is designed to assist students to acquire understanding of fundamentals of microbiology and identification of microorganisms. It also provides opportunities for practicing infection control measures in hospital setting.

Course Outline

Unit	Time (Hrs)	Content
I	5	Introduction: History of microbiology- (contribution of Louis Pasteur, Robert Koch, Joseph Lister, Edward Jenner, Alexander Fleming) Importance of Microbiology in the practice of Radiology Microscope –Types & Uses
II	5	General Microbiology: Infection, parasite, host, vector, fomite, contagious disease, infectious disease, epidemic, endemic, pandemic, Zoonosis, Epizootic, Attack rate Normal flora of the human body Routes of infection and spread, endogenous and exogenous infections at reservoir of infections Antimicrobials: mode of action, interpretation of susceptibility tests, resistance spectrum of activity Staining techniques: Gram staining, Acid fast staining, Culture methods Laboratory diagnosis of infection
III	10	Sterilization & Disinfection: Definition of Asepsis, Sterilization and Disinfection Hospital Acquired infection, Universal safety precautions and Biomedical waste Disposal & Management
IV	10	Immunology: Antigen- Antibody-reaction & application for Diagnosis, Immune response- Normal / Abnormal, Innate Immunity & acquired immunity (Vaccination) Hyper sensitivity & auto-immunity, Serological tests, Immunoprophylaxis
V	10	Bacteriology: Morphology, Classification according to the Pathogenicity, Mode of Transmission, methods of prevention, Collection and transport of samples for laboratory diagnosis, Interpretation of laboratory reports Staphylococci, Streptococci, & Pneumococci Neisseria, Mycobacterium: Tuberculosis, M. Leprae, Enterobacteriaceae, Escherichia Coli, Salmonella, Corynebacterium, Vibrios, V. Cholerae and other medically important Vibrio's, Campylobacters and Helicobacters Pseudomonas, Mycoplasma, Rickettsiae, Chlamydia, Bacillus anthracis, Sporing & nonsporing anaerobes, Clostridium

Unit	Time (Hrs)	Content
VI	10	Virology: General Properties, Basic structure and broad Classification of Viruses. Pathogenesis and Pathology of viral infection (HIV, Hepatitis, Polio, Measles, Congenital viral infections, Rubella, CMV, Herpes) Immunity and Prophylaxis of viral Diseases, Principles of viral diseases List of commonly used antiviral agents
VII	5	Parasitology: Amoebiasis, Malaria, Filariasis, Toxoplasma, cysticercosis, Roundworm, Hookworm, & Echinococcus.
VIII	5	Mycology: General Properties of Fungi, Classification based on fungal infection Candidiasis, Cryptococcosis, Dermatophytosis, Mycetoma, Aspergillosis.

Practical's:

- Introduction & visit to microbiology lab + Morphology of bacteria + Identification of bacteria (Culture plates & Basic biochemical reactions)
- Gram stain, Acid fast Stain
- Spotters, Instruments, Culture media inoculated & uninoculated
- Applied Immunology (Bacterial) Serological tests – CRP, ASO, RPR, Widal Applied Immunology (Virology) Serological tests: HIV, HBsAg (Rapid Tests)
- Stool Examination for eggs + Parasitology specimens

Reference Books :

1. Ananthanarayanan (R), Textbook of Microbiology, Orient Longman Ltd., 10th Ed, 2017.
2. Mackie and McCartney Practical Medical Microbiology, Relx India Pvt Ltd, 14th Ed, 2018.
3. Baveja CP, Textbook of Microbiology, APC, 6th ed, 2021.
4. Sriram Kumar (S), Textbook of Microbiology, All win Publication, 1st Ed, 2019

Examination Pattern (Subject with Theory & Practical Exam)

Theory exam:	80 marks
Practical exam	50 marks
Oral exam	20 marks
Internal assessment (Theory)	25 marks
Internal assessment (Practical)	25 marks

Duration

3 hours
3 hours

200 marks

The practical examination will have the following components

Gram stain	10 marks
Serology	10 marks
Disinfection / Hospital Infection control measure	10 marks
Spotter / chart	20 marks

50 marks

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 80 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	8 X 5 = 40 marks
Very Short answer	-	10 X 2 = 20 marks

C 2. Computer Application

Placement: I Year (II Semester)

Time: Theory: 30 Hours

Practical: 30 Hours (Lab)

Course Description: The course is designed for student to acquire the knowledge, develop basic understanding, use of computer and its applications in clinical field.

Course Outline

Unit	Time (Hrs)	Content
I	7	Introduction to Computer <ul style="list-style-type: none">• Concepts of computers• Hardware and Software• Trends and Technology• Application of Computer
II	8	Introduction to Disk Operating System <ul style="list-style-type: none">• DOS• Windows (all version)• MS Word• MS Excel with Pictorial Presentation• MS - Access• MS-Power Point
III	7	Statistical packages <ul style="list-style-type: none">• Types and their features
IV	8	Hospital Management System <ul style="list-style-type: none">• Types and uses• Electronic patient records

Reference Books:

1. Bansal Surabhi, Computer Applications for Allied Health Sciences, AITBS, 1st Edi, 2022.
2. Priyanka Randhir, Computer for Paramedical, CBS, 1st Edi, 2020
3. Pooja Jain & Neelam Kumari, Introduction to Computer, S.Vikas & Co, 5th edi, 2019
4. Shah Y.I, Paradkar A.R et.al, Introduction to Biostatistics and Computer Science, Nirali Prakashan Pub, 16th Edi, 2019.

C 3. First-Aid

Placement: I Year (II Semester)

Time: Theory – 30 Hrs
Practical - 30 Hrs (Lab)

Course description:

This course is designed to help students understand the basics of first aid and be able to render first aid services as and when need arises.

Course Outline

Unit	Time (Hrs)	Content
I	3	Introduction <ul style="list-style-type: none">• Definition of first aid, importance of first aid,• Golden rules of the first aid• Scope and concept of emergency
II	7	First aid in Skeletal injuries <ul style="list-style-type: none">• Definition, types of fractures of various parts of the body, causes, signs and symptoms, rules of treatment, transport of patients with fracture.• First aid measures in dislocation of joints, treatment of muscle injuries
III	3	Respiratory emergencies <ul style="list-style-type: none">• Asphyxia – Etiology, signs and symptoms, rules of treatment• Drowning – definition and management• Artificial respiration – types and techniques
IV	4	Shock and Unconsciousness <ul style="list-style-type: none">• Definition• Types of shock• Common causes of shock• Signs and symptoms of shock (assessment of established shock)• General and special treatment of established shock
V	3	Transportation of the injured <ul style="list-style-type: none">• Methods of transportation – single helper, hand seat, stretcher, wheeled transport (ambulance)• Precautions taken – blanket lift, air and sea travel
VI	2	Community emergencies <ul style="list-style-type: none">• Role of first aider (immediate and later) in<ul style="list-style-type: none">- Fires- Explosions- Floods- Earthquakes- Famine
VII	8	Bandages <ul style="list-style-type: none">• Bandaging• Basic turns• Bandaging extremities• Triangular bandages and their application

Reference Books:

1. Sanju Sira , First Aid Manual for Nurses, CBS, 1st Edi, 2017.
2. Gupta L.C. Manual of First Aid, Jaypee, 2nd Edi, 2017.
3. Indian Red Cross Society(RRC), Indian First Aid Manual, St. John Ambulance Association, 7th Edi, 2016.

6. Applied Anatomy & Physiology related to Cardiac Technology

Placement: II Year (III Semester)

Time: Theory: 60 Hours
Clinical: 320 Hours

Course Description:

This course will provide an outline of anatomy and physiology to improve the students understanding of technical and diagnostic procedures used with special emphasis on applied aspects.

Course outline

Unit	Time (Hrs)	Content
I	10	Anatomy of the heart and great vessels <ul style="list-style-type: none"> • Anatomy of the heart and great vessels • Gross anatomy and structural features of cardiac chambers Atrium, Ventricle, AV junction, Heart valves, Specialized conduction tissues, Sinus node, Inter nodal tracts, AV node, Bundles • Innervations of the heart – Sympathetic, Parasympathetic, Sensory. • Anatomy of the respiratory system
II	10	Coronary vascular system <ul style="list-style-type: none"> • Coronary arteries, Myocardial capillary bed, Venous drainage, Lymphatic drainage, • Systemic circulation-Arterial system, Venous system, Lymphatic system, Tissue perfusion and microcirculation • Pulmonary Circulation-Pulmonary artery, Pulmonary veins, Bronchial artery • Cerebral circulation
III	10	Over view of the cardiovascular system <ul style="list-style-type: none"> • Function of CVS, Circulation of blood, Central control of cardiovascular system • Cardiac cycle-Mechanical events, Arterial cycle and central venous pressure cycle, Clinical aspects of human cardiac cycle • Cardiac excitation, and contraction, Nervous control of the heart rate • Mechanism of contraction, Pacemaker of conduction system.
IV	10	Assessment of Cardiac Function: <ul style="list-style-type: none"> • Cardiac output-Fick's principle, Thermal dilution and indicator, dilution methods, Pulse Doppler methods, Miscellaneous methods • Control of stroke volume and cardiac output • Hemodynamics – Relationship between pressure, flow and resistance, Solute transport between blood and tissues, Circulation of fluid between plasma, interstitium and lymph

Unit	Time (Hrs)	Content
V	20	Vascular smooth muscle functions <ul style="list-style-type: none"> • Mechanism of contraction, Pharmacomechanical coupling, automaticity - Control of blood vessels - Local control mechanisms, Nervous control, Hormonal control • Specialization in individual circulation - Coronary circulation, Cerebral circulation, Pulmonary circulation, Cutaneous circulation • Cardiovascular receptors, reflexes and central control: Coordinated cardiovascular responses, Posture, Valsalva manoeuvre exercise, Diving reflex, cardiovascular responses in pathological situations, Shock and haemorrhage, Syncope, Essential hypertension, Chronic cardiac failure • Respiratory physiology: Mechanics of respiration, Principles of gas exchange, regulation of respiration • Hematology and coagulation physiology: Blood components Blood groups, Blood transfusion, Hemostasis

Reference Books :

1. Inderbir Singh, Textbook of Anatomy, Jaypee Brothers Publication, 7th Edi, Vol I to III, 2019
2. Chaurasia, Human Anatomy, CBS Publisher, 5th Edi, Vol 1 to 3, 2010.
3. Ross and Wilson Anatomy and Physiology in Health and illness, Elsever, 13th Edi, 2018.

Examination Pattern

Theory exam:	75 marks
Internal assessment (Theory)	25 marks

	100 marks

Duration

3 hours

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 75 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	7 X 5 = 35 marks
Very Short answer	-	10 X 2 = 20 marks

7. Applied Pharmacology

Placement: II Year (III Semester)

Time: Theory: 60 Hours
Clinical: 100 Hours

Course Description :

This course will cover general pharmacology with special emphasis on common drugs used, route of administration, types of formulations, dose and frequency of administration, side effects and toxicity, management of toxic effects, drug interaction, knowledge of chemical and trade names, importance of manufacture and expiry dates and instructions about handling of each drug.

Course outline

Unit	Time (Hrs)	Content
I	5	Anti Anginal Agents <ul style="list-style-type: none">• Beta Blocking agents – Propranolol, Atenolol, Metoprolol, Labetalol, Pindolol• Nitrates – Nitroglycerine, Isosorbide dinitrate, Isosorbide mononitrate, transdermal nitrate patches.• Calcium channel blockers – Nifedipine, verapamil, diltiazem, new calcium channel blockers.
II	25	Anti arrhythmic agents <ul style="list-style-type: none">• Diuretics – Furosemide, Thiazide diuretics, Other thiazide like agents, Potassium sparing diuretics, Combination diuretics, Special diuretic agents.• Angiotensin converting enzyme (ACE) inhibitors. Types of ACE inhibitors – Captopril, Enalapril, ACE inhibitors for diabetics and hypertensive renal disease.• Digitalis and acute inotropes – Digoxin, Digitoxin, Dobutamine, Dopamine, Adrenaline, Noradrenaline, Isoprenaline, Mixed inotropic vasodilators amrinone.• Quinidine and related compounds, Procainamide, Lidocaine, Mexiletine, Phenytoin, Flecainide, amiodarone, Bretylium, Combination therapy
III	10	Anti Hypertensive drugs <ul style="list-style-type: none">• Diuretics,• Beta Blockers,• ACE inhibitors,• Calcium antagonists,• Direct vasodilators,• Centrally active and peripherally active vasodilators.
IV	10	Antithrombotic agents <ul style="list-style-type: none">• Platelet inhibitors – Aspirin, Persantine• Anticoagulants – Heparin, Warfarin• Fibrinolytics – Streptokinase, Urokinase, Combination therapy
V	10	<ul style="list-style-type: none">• Lipid lowering and anti atherosclerotic drugs

Reference Books :

1. R.S.Satoskar, S.D. Bhandarkar, S. S. Ainapure, Pharmacology and Pharmacotherapeutics, 18th Edition, 2017
2. Tripathi.KD, Essentials of Medical Pharmacology, Jaypee Brothers, 8th Edition, 2018.

Examination Pattern

Theory exam:

75 marks

Internal assessment (Theory)

25 marks

100 marks
-----**Duration**3 hours

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 75 marks.
 2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.
-

Pattern of Question Paper:

Long answer question

- 2 X 10 = 20 marks

Short answer question

- 7 X 5 = 35 marks

Very Short answer

- 10 X 2 = 20 marks

C 4. Sociology

Placement: II Year (III Semester)

Time: Theory: 30 Hours

Course Description:

This course will introduce student to the basic sociology concepts, principles and social process, social institutions in relation to the individual, family and community and the various social factors affecting the family in rural and urban communities in India.

Course Outline

Unit	Time (Hrs)	Content
I	10	Introduction : <ul style="list-style-type: none">• Meaning - Definition and scope of sociology. Its relation to Anthropology, Psychology, Social Psychology• Methods of Sociological investigations - Case study, social survey, questionnaire, interview and opinion poll methods.• Importance of its study with special reference to health care professionals Social Factors in Health and Disease: <ul style="list-style-type: none">• Meaning of social factors• Role of social factors in health and disease Socialization: <ul style="list-style-type: none">• Meaning and nature of socialization• Primary, Secondary and Anticipatory socialization, Agencies of socialization
II	5	Social Groups: <ul style="list-style-type: none">• Concepts of social groups, influence of formal and informal groups on health and sickness. The role of primary groups and secondary groups in the hospital and rehabilitation setup. Family: <ul style="list-style-type: none">• The family, meaning and definitions Functions and types of family• Changing family patterns• Influence of family on individual's health, family and nutrition, the effects of sickness in the family and psychosomatic disease and their importance to physiotherapy Community: <ul style="list-style-type: none">• Rural community: Meaning and features - Health hazards to rural communities, health hazards to tribal community.• Urban community - Meaning and features - Health hazards of urbanities

Unit	Time (Hrs)	Content
III	5	Culture and Health: <ul style="list-style-type: none"> • Concept of Health • Concept of culture • Culture and Health • Culture and Health Disorders Social Change: <ul style="list-style-type: none"> • Meaning of social changes • Factors of social changes • Human adaptation and social change, Social change and stress • Social change and deviance • Social change and health program • The role of social planning in the improvement of health and rehabilitation
IV	10	Social Problems of disabled: <ul style="list-style-type: none"> • Consequences of the following social problems in relation to sickness and disability, remedies to prevent these problems • Population explosion • Poverty and unemployment • Beggary • Juvenile delinquency • Prostitution, Alcoholism • Problems of women in employment Social Security: <ul style="list-style-type: none"> • Social Security and social legislation in relation to the disabled Social Work: <ul style="list-style-type: none"> • Meaning of Social Work • The role of a Medical Social Worker

Reference Books:

1. Anthony Giddens: Sociology, Atlantic Publications & Distributors Pvt Ltd, 8th Edi, 2022.
2. Vidya Bhushan & Sachdeva, An Introduction to Sociology, Kitab Mahal, 1st Edi, 2017.
3. Ralhan.S, introduction to Sociology, Common Wealth publications, 1st Edition, 2018.

8. Introduction to Cardiac Technology

Placement: II Year (IV Semester)

Time: Theory: 60 Hours
Clinical: 320 Hours

Course Description:

This course will help the students to gain basic knowledge on ECG, Exercise ECG, Echocardiography and in Doppler Echocardiography.

Course Outline

Unit	Time (Hrs)	Content
I	25	Electrocardiography (ECG) <ul style="list-style-type: none"> • Basic Principles of the Electrocardiographic paper, the Electrocardiograph, the Electrical field of Heart and the leads: Standard limb, Precordial lead, 'V' lead & 'AV' lead, Basic ECG deflections Basic action of electrocardiograph • Normal ECG, the 'P' wave, the 'qrs' complex, the genesis of 'qrs' complex, T wave; the S-T segment, the 'U' wave Rate & rhythm – the Q-T interval • The Electrical axis • Precordial pattern of ECG • Chamber enlargement – atrial enlargement, LV hypertrophy & RV hypertrophy • Bundle branch block: General principle, Right Bundle branch block, Left bundle branch block and the Hemi blocks (Fascicular block)
II	10	Exercise stress Testing <ul style="list-style-type: none"> • Exercise Physiology • Exercise protocols • Electrocardiography measurements • Exercise testing – Indication, techniques & complications.
III	25	Echocardiography <ul style="list-style-type: none"> • Principles of Echocardiography • Basic principles of ultrasound • M-Mode of Echocardiography • Two-dimensional Echocardiography • Doppler Echocardiography; color flow • Transoesophageal Echocardiography • Stress Echocardiography • Instrumentation • Basic pulse Echo system • Transducers • Pulse generation • Echo detection • A- mode, B-Mode, M-Mode • Display & recording • Echocardiographic Examination • Selecting transducers • Position of the patient • Placement of the transducer • Setting control • M-Mode labelling • 2 D Echo • Normal variants • Terminology • identification of segments Doppler Echocardiography <p>a) Introduction to Doppler color Echocardiography: The Doppler principles, Doppler ultrasound techniques, Color Doppler flow imaging and Clinical application of Doppler Echocardiograph</p>

Unit	Time (Hrs)	Content
		b) Physical principles & instrumentation in spectral & color Doppler flow imaging c) Physical principles and Doppler Effect. The Doppler Echocardiography system display d) Blood flow pattern – Laminar & non- laminar flow e) Doppler Echo cardiography modes • Continuous wave Doppler system • Pulsed Doppler system • High pulse repetition frequency • Problem of colour imaging f) Contrast Echo g) Echo measurement

Practical's:

- Normal ECG interpretation
- Normal Echo interpretation
- Instruments: Monitor, Defibrillator, ECG, TMT and Cath Lab. Machines

Reference Books:

1. Goldberger, A Text book of Electrocardiography, elsevier publications, 9th edition, 2017
2. K.C. Verma Sourabh verma, Clinical Echocardiography, CBS Publishers & Distributors, 2010.

Examination Pattern

Theory exam: (one paper)	80 marks
Practical exam	50 marks
Oral exam	20 marks
Internal assessment (Theory)	25 marks
Internal assessment (Practical)	25 marks

	200 marks

Duration

3 hours
3 hours

The practical examination will have the following components

Identification of Spotters (General)	20 marks
Identification of Basics of ECG	15 marks
Identification of Basics of ECHO	15 marks

50 marks

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 80 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Distribution of Course Content

1. Electro Cardiography & Exercise Stress testing
2. Echocardiography

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	8 X 5 = 40 marks
Very Short answer	-	10 X 2 = 20 marks

9. Medical Disorders relevant to Cardiac Technology

Placement: II Year (IV Semester)

Time: Theory: 60 Hours
Clinical: 100 Hours

Course Description:

This course will discuss about the medical disorders of Cardiovascular, Respiratory, Hematology System, Pregnancy, Pediatric and Elderly.

Course Outline

Unit	Time (Hrs)	Content
I	25	Cardiovascular System <ul style="list-style-type: none">• Ischemic heart diseases• Rheumatic heart disease• Congenital heart disease• Hypertension• Aortic Aneurysms• Cardiomyopathy• Peripheral vascular disease• Pulmonary edema and LV failure
II	5	Hematology <ul style="list-style-type: none">• Anaemia• Bleeding disorders• Laboratory tests used to diagnose bleeding disorders (in brief)
III	15	Respiratory System <ul style="list-style-type: none">• Chronic obstructive pulmonary diseases (COPD)• Concept of obstructive versus restrictive pulmonary disease• PFT and its interpretation
IV	15	Others <ul style="list-style-type: none">• DM• Obesity• Pregnancy• Paediatric Patient (neonate/Infant)• Elderly patient

Reference Books:

1. Davidsons, Principle and Practice of Medicine, Elsevier, 24th Edition, 2022
2. Kanu Chatterjee, Cardiac Drugs, Jaypee publications, 1st edition, 2013

Examination Pattern

Theory exam:	75 marks
Internal assessment (Theory)	25 marks

	100 marks

Duration

3 hours

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 75 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	7 X 5 = 35 marks
Very Short answer	-	10 X 2 = 20 marks

C 5. Environmental Science

Placement: II Year (IV Semester)

Time: Theory: 30 Hours

Course Description: The students should gain the knowledge to understand the multidisciplinary nature of the environment and the awareness of the eco system, which maintains the natural environment.

Course outline

Unit	Time (Hrs)	Content
I	2	Multi-disciplinary nature of environmental studies <ul style="list-style-type: none"> • Definition • Scope and importance • Need for public awareness.
II	7	Natural Resources: Renewable and non-renewable resources: <ul style="list-style-type: none"> • Natural resources and associated problems. <ul style="list-style-type: none"> - Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. - Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. - Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. - Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources • Equitable use of resources for sustainable life styles
III	4	Ecosystems <ul style="list-style-type: none"> • Concept of an ecosystem. • Structure and function of an ecosystem. • Producers, consumers and decomposers. • Energy flow in the ecosystem. • Ecological succession. • Food chains, food webs and ecological pyramids. • Introduction, types, characteristic features, structure and function of the following ecosystems:- <ul style="list-style-type: none"> - Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit	Time (Hrs)	Content
IV	5	Biodiversity and its conservation <ul style="list-style-type: none"> • Introduction – Definition: genetic, species and ecosystem diversity. • Bio geographical classification of India. • Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. • Biodiversity at global, National and local levels. • India as a mega-diversity nation. • Hot-spots of biodiversity. • Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. • Endangered and endemic species of India • Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
V	3	Environmental Pollution <ul style="list-style-type: none"> • Definition Cause, effects and control measures of :- <ul style="list-style-type: none"> - Air pollution - Water pollution - Soil pollution - Marine pollution - Noise pollution - Thermal pollution - Nuclear hazards • Solid waste Management: Causes, effects and control measures of urban and industrial wastes. • Role of an individual in prevention of pollution. • Pollution case studies. • Disaster management: floods, earthquake, cyclone and landslides.
VI	6	Social Issues and the Environment <ul style="list-style-type: none"> • From Unsustainable to Sustainable development • Urban problems related to energy • Water conservation, rain water harvesting, watershed management • Resettlement and rehabilitation of people; its problems and concerns. • Environmental ethics: Issues and possible solutions. • Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. • Wasteland reclamation. • Consumerism and waste products. • Environment Protection Act. • Air (Prevention and control of Pollution) Act. • Wildlife Protection Act • Forest Conservation Act • Issues involved in enforcement of environmental legislation
VII	3	Human Population and the Environment <ul style="list-style-type: none"> • Population growth, variation among nations. • Population explosion – Family Welfare Programme.

Unit	Time (Hrs)	Content
		<ul style="list-style-type: none"> • Environment and human health. • Human Rights. • Value Education. • HIV/AIDS • Women and Child Welfare. • Role of Information Technology in Environment and human health.

Reference Books:

1. Agarwal, R.K, Environmental Science, Krishna Prakashan, 1st Edition.2020.
2. Bharucha Erach, The Biodiversity of India, Mapin Publication, 1st edition, 2002.

10. Cardiac Technology – Applied - I

Placement: III Year (V Semester)

Time: Theory: 60

Hours

Clinical: 230 Hours

Course Description:

This course will provide training to students in all aspects of instrumentation and recording techniques in echocardiography. At the end of the course, the students will be able to perform a echocardiography using color Doppler under the supervision of a physician.

Course Outline

Unit	Time (Hrs)	Content
I	20	<ul style="list-style-type: none"> • Echo in rheumatic heart disease – Echo in mitral stenosis, mitral incompetence, aortic stenosis, aortic incompetence, pulmonary hypertension. Post AVR, post MVR. Prosthetic valve malfunction, LAclot. • Echo in congenital heart disease – Echo in ASD, VSD, PDA, pulmonary stenosis, aortic stenosis, coarctation of aorta, TOF. Dextrocardia. • Echo in ischemic heart disease – Echo in acute myocardial infarction, old myocardial infarction and other ischemic heart disease related conditions, LV aneurysm
II	10	<ul style="list-style-type: none"> • Echo in other cardiovascular disease – Echo in various types of cardio myopathy, infective endocarditis diseases of aorta, mitral valve prolapse, myxoma and other cardio vascular diseases. • Assessment of Cardiac function – measurements of all cardiac chambers and assessment of cardiac function • Echo in pericardial disease – pericardial effusion, cardiac tamponade, constructive pericarditis
III	15	<ul style="list-style-type: none"> • Cardiac catheterization laboratory – general details of cardiac catheterization equipment, how to handle the machine, common problems one may come across and how to overcome it, radiation hazards • Materials used in the Cath lab – all catheters, balloons, guide wires, pacemakers contrast material and other material used in the cardiac catheterization laboratory and sterilization of all these materials • Right heart catheterization – procedure, cath position, oximetry at various levels, angios done and its interpretation • Left heart catheterization – procedure, cath position, oximetry at various levels, angios done and its interpretation.
IV	10	Coronary angiogram <ul style="list-style-type: none"> • Procedure, materials used, type and amount dye used, indications and contraindications, various pictures recorded in various angles and gross interpretation.
V	5	Peripheral angiogram <ul style="list-style-type: none"> • Procedure, indication and contraindication.

Practicals

- Echo in rheumatic heart disease
- Echo in congenital heart disease
- Echo in ischemic heart disease
- Echo in other cardiovascular disease
- Assessment of Cardiac function
- Echo in pericardial disease

Reference books:

1. Goldberger, A Text book of Electrocardiography, Elsevier pub, 9th edition, 2017
2. K.C. Verma Sourabh verma, Clinical Echocardiography, CBS Publishers, 2010.
3. Arman T. Askari, Introductory Guide to Cardiac Catheterization, LWW pub, 1st edi, 2010

Examination Pattern

Theory exam:	75 marks
Internal assessment (Theory)	25 marks

	100 marks

Duration

3 hours

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 75 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	7 X 5 = 35 marks
Very Short answer	-	10 X 2 = 20 marks

11. Cardiac Technology - Applied - II

Placement: III Year (V Semester)

Time: Theory: 60 Hours

Clinical: 190 Hours

Course Description:

This course will provide training to the students in all aspects of instrumentation and recording techniques for electrocardiography, treadmill exercise stress testing, and Holter monitoring. At the end of the course, the students will be able to perform a 12 lead ECG, assist in treadmill exercise testing, under the supervision of a physician.

Course Outline

Unit	Time (Hrs)	Content
I	25	<ul style="list-style-type: none">• Interpretation of Normal ECG and abnormalities in RHD, IHD & CHD• ECG in myocardial infarction- definition of myocardial infarction, diagnosis of myocardial infarction, ECG criteria for myocardial infarction, ECG in anterior wall, true posterior wall and sub endocardial infarction and RV infarction• ECG in rheumatic heart disease – definition of rheumatic heart disease, valvular involvement in rheumatic heart disease, ECG in mitral stenosis, mitral incompetence, aortic stenosis and aortic incompetence• ECG in hypertension- definition of hypertension, how to record blood pressure, ECG in hypertension• ECG in congenital heart disease- common congenital heart disease ASD, VSD, PDA, pulmonary stenosis, aortic stenosis, coarctation of aorta, TOF, definition of all these conditions, ECG changes in all these conditions
II	20	<ul style="list-style-type: none">• ECG in other conditions – ECG in various types of cardiomyopathy, myxedema, pericardial effusion, acute pericarditis and other vascular diseases. Bundle branch block, WPW syndrome, dextrocardia• Trans esophageal echocardiogram – indications, procedure, usefulness and complications one may encounter and its management• Stress Echo- procedure and indications• Peripheral Doppler – Procedure and usefulness of peripheral Doppler• Coronary angioplasty- Procedure, materials used, complication one may encounter and how to manage it
III	15	<ul style="list-style-type: none">• Peripheral angioplasty – materials used and procedure. Angioplasty of coarctation of aorta• Fetal echocardiogram – Procedure, basic interpretation• Contrast echocardiogram – procedure and usefulness of contrast echocardiogram

Practical's:

- Interpretation of Normal ECG and in abnormalities
- Assessment of Cardiac Function
- ECG in myocardial infarction
- ECG in rheumatic heart disease
- ECG in hypertension
- ECG in congenital heart disease
- ECG in other conditions
- Trans esophageal echocardiogram Peripheral Doppler –Coronary angioplasty
- Peripheral angioplasty

Reference books:

1. Goldberger, A Text book of Electrocardiography, Elsevier pub, 9th edition, 2017
2. K.C. Verma Sourabh Verma, Clinical Echocardiography, CBS Publishers, 2010.
3. Arman T. Askari, Introductory Guide to Cardiac Catheterization, LWW pub, 1st edi, 2010

Examination Pattern		Duration
Theory exam: (one paper)	80 marks	3 hours
Practical exam	50 marks	3 hours
Oral exam	20 marks	
Internal assessment (Theory)	25 marks	
Internal assessment (Practical)	25 marks	

	200 marks	

The practical examination will have the following components

Identification of Spotters	20 marks
Identification of instruments use and functions	15 marks
Identification of basic ECG interpretations	15 marks

	50 marks

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 80 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Distribution of Course Content 80 marks

1. Echo basics, Temporary and Permanent pacing
2. Coil closure and device closure of PDA, ASD and VSD, Electrophysiological studies

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	8 X 5 = 40 marks
Very Short answer	-	10 X 2 = 20 marks

C 6. Medical Ethics

Placement: III Year (V Semester)

Time: Theory: 30 Hours

Course Description:

The Course is designed to understand the basics of Medical Law and Ethics in relation to clinical science.

Course Outline

Unit	Time (Hrs)	Content
I	5	<ul style="list-style-type: none">• Introduction to Ethics-• what is ethics• what are values and norms• Hippocratic oath
II	15	<ul style="list-style-type: none">• Ethics of individual• Doctor patient relationship.• right to be respected.• Truth and confidentiality• Autonomy of decision• The patient as a person
III	10	<ul style="list-style-type: none">• Professional Ethics-• Code of conduct• malpractice and negligence.• contract and confidentiality.

Reference Books:

1. Erich H Loewy, Text book of Medical Ethics, Springer publications, 1st edi, 2014.
2. Shaun.D.Pattinson, Medical Laws and Ethics, Sweet and Maxwell, 5th Edi, 2015.
3. Princy Louis Palatty et.al - A Textbook of Bioethics for Healthcare Professionals, 1st Edi, 2018

12. Advance Cardiac Technology – I

Placement: III Year (VI Semester)

Time: Theory: 60 Hours

Clinical: 150 Hours

Course Description:

This course will provide training to the students in all aspects of advance instrumentation and recording techniques for electrocardiography, treadmill exercise stress testing and Holter monitoring. At the end of the course, the students will be able to perform a 12 lead ECG, assist in treadmill exercise testing, under the supervision of a physician.

Course Outline

Unit	Time (Hrs)	Content
I	20	<ul style="list-style-type: none"> • Myocardial Contrast Echo- Basic knowledge • Cardiac monitoring – definition, purpose of cardiac monitoring, how to Recognize various arrhythmias how to set up a intensive Coronary care unit and usefulness of ICCU • Interpretation of TMT, report – criteria for TMT positive test contraindication for TMT conditions where TMT is not useful, complications that may occur in TMT room and its management. • Complications during the procedure and its management of cardiac arrest – definition, causes external cardiac Massage, artificial respiration and other drugs and procedures used in the management of Cardiac arrest, Myocardial perfusion scan – procedures and usefulness of myocardial perfusion scan, Cardiac arrhythmias – brady arrhythmia and tachy arrhythmias and ECG diagnosis of all rhythm disturbances. Sinus arrhythmia, complete heart block, Electrolyte disturbances – ECG in hypokalemia, hyperkalemia etc. • Holter monitoring – procedure and usefulness of Valvuloplasty – procedure, indications, complications and treatment of balloons, mitral valvuloplasty, balloon aortic valvuloplasty balloon Pulmonary valvuloplasty and balloon tricuspid valvuloplasty. • Ambulatory ECG recording (holter) and ambulatory BP
II	20	<ul style="list-style-type: none"> • Mobitz type 1 and 2 block • Complete heart block • Direct current (DC) shock • Monophasic and biphasic shock • Technique of Cardioversion • Indications for Cardioversion
III	15	<ul style="list-style-type: none"> • Treadmill exercise stress testing and 24 hours • Exercise physiology, exercise protocol, lead system, patient preparation • Exercise test indications, contra indications and precautions • Cardiac arrhythmias and conduction disturbances during stress. • Testing emergencies in the stress testing lab

Unit	Time (Hrs)	Content
IV	5	<ul style="list-style-type: none"> • Temporary and permanent pacing – materials used, procedure, complications and its management. Implantable Cardioverter defibrillator devices • CD recording and storage- recording and storage of all the procedures over CD • Intravascular ultrasound. • O.C.T

Practical's:

- Interpretation of Normal Echo and Basic abnormalities
- External Cardiac Massage
- TMT
- Holter monitoring
- Pace maker
- CABG
- Oximeter
- CVP Monitoring
- Defibrillator
- Doppler imaging
- Treadmill exercise stress testing and 24 hours
- Ambulatory ECG recording (Holter) and ambulatory BP

Reference books:

1. Goldberger, A Text book of Electrocardiography, Elsevier pub, 9th edition, 2017
2. K.C. Verma Sourabh verma, Clinical Echocardiography, CBS Publishers, 2010.
3. Arman T. Askari, Introductory Guide to Cardiac Catheterization, LWW pub, 1st edi, 2010

Examination Pattern

Theory exam:	75 marks
Internal assessment (Theory)	25 marks

	100 marks

Duration

3 hours

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 75 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	7 X 5 = 35 marks
Very Short answer	-	10 X 2 = 20 marks

13. Advance Cardiac Technology – II

Placement: III Year (VI Semester)

Time: Theory: 60 Hours

Clinical: 270 Hours

Course Description:

This course will provide training to the students in all aspects in advanced instrumentation and recording techniques for electrocardiography, echocardiography, treadmill exercise stress testing, Holter monitoring and Nuclear Cardiology. At the end of the course, the students will be able to perform a advanced 12 lead ECG, assist in treadmill exercise testing in special conditions, perform echocardiography using color Doppler and help in Nuclear Imaging under the supervision of a physician.

Course Outline

Unit	Time (Hrs)	Content
I	10	<ul style="list-style-type: none">Advanced Cardiac monitoring – definition, purpose of cardiac monitoring, how to Recognize various arrhythmias how to set up a intensive coronary care unit and usefulness of ICCUInterpretation of TMT in special conditions, report – criteria for TMT positive test contraindication for TMT conditions where TMT is not useful, complications that may occur in TMT room and its management
II	15	<ul style="list-style-type: none">Use of defibrillator – indications, how to use the defibrillator, complications during the procedure and its managementManagement of cardiac arrest, Myocardial perfusion scan, Cardiac arrhythmiasAortic angiography – aortic root, arch, abdominal aortaPeripheral angiography and carbodioxide angiographyElectrolyte disturbances – ECG in hypokalemia, hyperkalemia etc.Nuclear Cardiology & Nuclear Imaging
III	15	<ul style="list-style-type: none">Valvuloplasty- procedure, indications, complications and treatment of balloons, mitral valvuloplasty, balloon aortic valvuloplasty balloon pulmonary valvuloplasty and balloon tricuspid valvuloplasty.Coil closure and device closure of PDA – procedure, indications and materials used for coil and device closure of PDADevice closure of ASD – procedure, indications and materials used for device closure of ASDDevice closure of VSD – procedure, indications and materials used for device closure of VSD

Unit	Time (Hrs)	Content
IV	10	<ul style="list-style-type: none"> • Cardiac Electrophysiological studies – basic knowledge of EP study mapping and ablation, catheters used, connection of catheters, equipment used in arrhythmia induction and mapping radio frequency ablation. • Oximetry – handling of the instrument and usefulness of the instrument, normal and abnormal values • Pressure recording- handling of the instrument and pressures in various chambers, normal and abnormal values • Cardiac pacing: Temporary and Permanent
V	10	<ul style="list-style-type: none"> • Catheterization and angiography in children with congenital heart disease contrast agents: ionic and non-ionic types , non-ionic agents, contrast nephropathy and measures to reduce incidence of contrast. • Pediatric interventions: Aortic and pulmonary valvuloplasty & Coarctation angioplasty and stenting. • Nephropathy coronary angioplasty (PTCA): Equipment and hardware used in PTCA, guiding catheters, guidewires, Ballons, Stents, Setting up the Laboratory for a PTCA, Case management of complications, Slow flow / no flow, acute stent thrombosis, dissection and Perforation • Procedure during pregnancy- precautions to be followed.

Practical's:

- Cardiac monitoring
- Interpretation of TMT, report
- Use of defibrillator
- Management of cardiac arrest
- Myocardial perfusion scan
- Cardiac arrhythmias
- Electrolyte disturbances
- Holter monitoring
- Valvuloplasty
- Coil closure and device closure of PDA
- Device closure of ASD
- Device closure of VSD
- Electrophysiological studies
- Oximetry
- Pressure recording
- Temporary and permanent pacing
- CD recording and storage
- Procedure during pregnancy
- Nuclear Cardiology
- Fetal echocardiogram
- Contrast echocardiogram

Reference Books:

1. The Echo Manual (1st South Asian Edi)-, CBS Publisher, 2022
2. Leo Schamroth- an Introduction to Electrocardiography, 8th Edi, Wiley, 2013
3. Arman T. Askari, et al. – Introductory Guide to Cardiac Catheterization, 2nd Edi, Wolter Kluwer, 2012.
4. Kern'S - Cardiac Catheterization Handbook, 7th Edition, Elsevier, 2022

Examination Pattern

Theory exam: (one paper)

80 marks

Practical exam

50 marks

Oral exam

20 marks

Internal assessment (Theory)

25 marks

Internal assessment (Practical)

25 marks

200 marks
-----**Duration**

3 hours

3 hours

The practical examination will have the following components

Identification of Spotters

20 marks

Case Presentation

15 marks

Identification of changes in ECG (Advanced)

15 marks

50 marks
-----**Guidelines for setting Question Paper for Theory Examination:**

1. Prepare the question papers for 80 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Distribution of Course Content

1. Cardiac Monitoring, TMT, Defibrillator, Electrophysiological studies, Holter Monitoring and Nuclear cardiology
2. Management of Cardiac arrest, Arrhythmias, Temporary and Permanent pacing and Valvoplasties

Pattern of Question Paper:

Long answer question

- 2 X 10 = 20 marks

Short answer question

- 8 X 5 = 40 marks

Very Short answer

- 10 X 2 = 20 marks

C 7. Bio Statistics & Research Methodology

Placement: III Year (VI Semester)

Time: Theory: 30 Hours

Course Description :

At the end of the course, the students will be able to develop an understanding of the statistical methods and apply them in conducting research studies.

Course Outline

Unit	Time (Hrs)	Content
I	3	Introduction: <ul style="list-style-type: none"> • Concepts, types, significance and scope of statistics, Meaning of data, Sample, parameter • Type and levels of data and their measurement • Organization and presentation of data – Tabulation of data; Frequency distribution – Graphical and tabular presentations
II	2	Measures of central tendency: <ul style="list-style-type: none"> • Mean, Median, Mode Measures of variability: <ul style="list-style-type: none"> • Range, Percentiles, average deviation, quartile deviation, standard deviation
III	2	Normal Distribution: <ul style="list-style-type: none"> • Probability, • Characteristics and application of normal probability curve; • Sampling
IV	4	Measures of relationship: <ul style="list-style-type: none"> • Correlation – need and meaning • Rank order correlation • Scatter diagram method • Product moment correlation • Simple linear regression analysis and prediction.
V	4	Significance of Statistic and Significance of difference between two statistics (Testing hypothesis) <ul style="list-style-type: none"> • Non parametric test – Chi-square test, Sign, median test, Mann Whitney test. • Parametric test – ‘t’ test, ANOVA, MANOVA, ANCOVA
VI	7	Research Methods: <ul style="list-style-type: none"> • Research Meaning- • Scope and Objectives • .Research methods vs. Methodology. Types of research <ul style="list-style-type: none"> • Descriptive vs. Analytical, • Applied vs. Fundamental, • Quantitative vs. Qualitative, • Conceptual vs. Empirical,

Unit	Time (Hrs)	Content
		Concept of applied and basic research process, <ul style="list-style-type: none"> Defining and formulating the research problem Selecting the problem, necessity of defining the problem, Importance of literature review in defining a problem, criteria of good research. Literature review <ul style="list-style-type: none"> Primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research data base, development of working hypothesis
VII	8	Data Collection and Sampling: <ul style="list-style-type: none"> Data collection Classification of data Class intervals Continuous and discrete measurements Drawing frequency polygon types of frequency polygon Histogram Accepts of method validation, observation and collection of data, methods of data collection Sampling methods, Data processing and analysis strategies and tools, data analysis with statistical package <ul style="list-style-type: none"> Sigma STAT, SPSS for student t-test, ANOVA, etc. hypothesis testing. Correlation <ul style="list-style-type: none"> historical contribution meaning of correlation types: Product, moment, content correlation, variation of product, movement correlation, rank correlation, Regression analysis. <ul style="list-style-type: none"> Tests of significance- need for sampling error significance of the mean significance of differences between means interpretation of probability levels – small samples – large samples.

Research Project Description:

This project study shall be done by individuals or by group of individual students of the same class during internship. The student should identify a problem area of relevance to the theory and / or practice of Cardiac Technology to carry out an investigation of one aspect of that problem area, and to present a clear report on the process and result of the project work done.

The students are encouraged to identify problems of special interest to them that fall within the interest areas of Cardiac Technology services, and to aim towards knowledge on the topic in the specified problem area.

Desirable:

- A Research study to be done and submit the report before the one year of Internship.
- One or more value added courses (like Swayam) during final year or Internship.

Reference Books:

1. Mahajan B.K., Methods in Biostatistics for Medical Students and Research Workers, Jaypee, 9th Edi, 2018.
2. Sundar Rao & Richard, Introduction to Biostatistics & Research Methods, Prentice Hall of India, New Delhi, 5th edition, 2012.
3. Negi K.S., Biostatistics, A.I.I.B.S, 1st Edi, 2013.
4. Rao & Murthy, Applied Statistics in Health Sciences, J.B. Brothers, New Delhi 2010.
5. Visweswara Rao, Biostatistics & Manual of Statistical Methods for use in Health, Nutrition and Anthropology, J.B. Brothers Publishers Pvt. Ltd., 2009.

VIII. Question Paper Pattern

(Subject with Theory and Practical Exam)

Guidelines for setting a Question Paper for Theory Examination:

1. Prepare the question papers for 80 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Pattern of Question Paper

Time: 3 hours

Max Marks: 80

2x 10 =20 marks

I. Write essay on any TWO

- 1.
- 2.
- 3.

II. Write short notes on any EIGHT

8 x 5 =40 marks

- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.

III. Very Short Answer – Answer all questions:

10 x 2 = 20 marks

- 14.
- 15.
- 16.
- 17.
- 18.
- 19.
- 20.
- 21.
- 22.
- 23.

VIII. Question Paper Pattern
(Subject with Theory Exam and no Practical)

Guidelines for setting a Question Paper for Theory Examination:

1. Prepare the question papers for 75 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Pattern of Question Paper

Time – 3 Hours

Maximum Marks – 75 Marks

2x 10 =20 marks

I. Write essay on any TWO

- 1.
- 2.
- 3.

II. Write short notes on any SEVEN

7 x 5 =35 marks

- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

III. Very Short Answer – Answer all questions:

10 x 2 = 20 marks

- 13.
- 14.
- 15.
- 16.
- 17.
- 18.
- 19.
- 20.
- 21.
- 22.