Study Scheme & Syllabus of

Bachelor of Cardiac Care Technology

Batch 2021 Onwards

By

Board of Studies

I K GUJRAL PUNJAB TECHNICAL UNIVERSITY KAPURTHALA

INDEX

Program Educational Objectives: At the end of the Program, the student will be able to: -	
PEO1	To cover all aspects of cardiovascular disease management and care.
PEO2	To learn the complex diagnostic and therapeutic procedures that involve use of various catheterization equipment, computer hardware, tools, machines and pharmacological agents.
PEO3	To acquire skills for management of various cardiac disorders.
PEO4	To learn how to study, interpret and care for anatomical specimens.

Program Outcomes: At the end of the Program, the student will be able to: -	
PO1	Fundamental knowledge of human anatomy.
PO2	Detailed knowledge of cardiovascular system.
PO3	Developing effective communication skills.
PO4	Developing empathy and counseling skills.
PO5	Learning technical skills of cardiology.
PO6	Providing higher education opportunity.
PO7	Developing capabilities of medical diagnosis and research.
PO8	Problem solving skills and ability to analyze.
PO9	Developing leadership skills and working in diverse environment.
PO10	Developing medical ethics and moral values.
PO11	Basic knowledge on research methodology.

Program Specific Outcomes: At the end of the Program, the student will be able to: -	
PSO1	Detailed subject knowledge of anatomy, physiology with awareness and comprehending along with all related ailments.
PSO2	Developing understanding of counselling, intensive care and resuscitation.
PSO3	Becoming expert as an associate to all interventional cardiology procedures and machinery.
PSO4	Introduction to advancement in cardiac care.

Semester		**First (1st)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical***	**Studio (If Applicable)**	**Internal**	**External**		
BCCT101-21	Allied Health Sciences	Core Theory	Basics of Anatomy-I	3	1	0	0	40	60	100	4
BCCT102-21	Allied Health Sciences	Core Theory	Basics of Physiology-I	3	1	0	0	40	60	100	4
BCCT103-21	Allied Health Sciences	Core Theory	Basics of Biochemistry-I	3	1	0	0	40	60	100	4
BCCT104-21	Allied Health Sciences	Core Practical/ Lab	Basics of Anatomy-I	0	0	4	0	60	40	100	2
BCCT105-21	Allied Health Sciences	Core Practical/ Lab	Basics of Physiology-I	0	0	4	0	60	40	100	2
BCCT106-21	Allied Health Sciences	Core Practical/ Lab	Basics of Biochemistry-I	0	0	4	0	60	40	100	2
BTHU-103-18	Allied Health Sciences	Ability Enhancement Compulsory Course (AECC)	English	1	0	0	0	40	60	100	1
BTHU-104-18	Allied Health Sciences	Ability Enhancement Compulsory Course	English	0	0	2	0	30	20	50	1

		(AECC)									
HVPE-101-18	Allied Health Sciences	Ability Enhancement Compulsory Course (AECC)	Human Values, De-addiction & Traffic Rules	3	0	0	0	40	60	100	3
HVPE-102-18	Allied Health Sciences	Ability Enhancement Compulsory Course (AECC)	Human Values, De-addiction & Traffic Rules (Lab/ Seminars)	0	0	1	0	25	**	25	1
BMPD-102-18	Allied Health Sciences	Ability Enhancement Compulsory Course (AECC)	Mentoring & Professional Development	0	0	1	0	25	**	25	1

*A course can either have four Hrs Lecture or Three Hrs Lecture + One Hrs Tutorial as per requirement

** Mentoring and Professional Development course will have internal evaluation only

Semester		**Second (2nd)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BCCT201-21	Allied Health Sciences	Core Theory	Basics of Anatomy-II	3	1	0	0	40	60	100	4
BCCT202-21	Allied Health Sciences	Core Theory	Basics of Physiology-II	3	1	0	0	40	60	100	4
BCCT203-21	Allied Health Sciences	Core Theory	Basics of Biochemistry-II	3	1	0	0	40	60	100	4
BCCT204-21	Allied Health Sciences	Core Practical/ Lab	Basics of Anatomy-II	0	0	4	0	60	40	100	2
BCCT205-21	Allied Health Sciences	Core Practical/ Lab	Basics of Physiology-II	0	0	4	0	60	40	100	2
BCCT206-21	Allied Health Sciences	Core Practical/ Lab	Basics of Biochemistry-II	0	0	4	0	60	40	100	2
EVS102-18	Allied Health Sciences	Ability Enhancement Compulsory Course (AECC)	Environmental Studies	2	0	0	0	40	60	100	1
BMPD-102-18	Allied Health Sciences	Ability Enhancement Compulsory Course (AECC)	Mentoring & Professional Development	0	0	1	0	25	**	25	1

*A course can either have four Hrs Lecture or Three Hrs Lecture + One Hrs Tutorial as per requirement

** Mentoring and Professional Development course will have internal evaluation only

Semester		**Third (3rd)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical***	**Studio (If Applicable)**	**Internal**	**External**		
BCCT301-21	Allied Health Sciences	Core Theory	Anatomy and Physiology of Cardiovascular system	3	1	0	0	40	60	100	4
BCCT302-21	Allied Health Sciences	Core Theory	Applied Microbiology	3	1	0	0	40	60	100	4
BCCT303-21	Allied Health Sciences	Core Theory	General Pharmacology	3	1	0	0	40	60	100	4
BCCT304-21	Allied Health Sciences	Core Theory	Electrocardiography (ECG)	3	1	0	0	40	60	100	4
BCCT305-21	Allied Health Sciences	Core Theory	Life Style Diseases	3	1	0	0	40	60	100	4
BCCT306-21	Allied Health Sciences	Core Practical/ Lab	Anatomy and Physiology of Cardiovascular system	0	0	4	0	60	40	100	3
BCCT307-21	Allied Health Sciences	Core Practical/ Lab	Applied Microbiology	0	0	3	0	60	40	100	3
BCCT308-21	Allied Health Sciences	Core Practical/ Lab	General Pharmacology	0	0	4	0	60	40	100	3
BCCT309-21	Allied Health Sciences	Core Practical/ Lab	Electrocardiography (ECG)	0	0	4	0	60	40	100	4

BCCT310-21	Allied Health Sciences	Core Practical/ Lab	Life Style Diseases	0	0	4	0	60	40	100	3
BCCT311-21	Allied Health Sciences	Core Theory	Non-invasive Diagnosis Cardiovascular system	2	0	0	0	40	60	100	2

*A course can either have four Hrs Lecture or Three Hrs Lecture + One Hrs Tutorial as per requirement

Semester		**Fourth (4th)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical***	**Studio (If Applicable)**	**Internal**	**External**		
BCCT401-21	Allied Health Sciences	Core Theory	Basic Patient care	3	1	0	0	40	60	100	4
BCCT402-21	Allied Health Sciences	Core Theory	Basics Cardiac Evaluation	3	1	0	0	40	60	100	4
BCCT403-21	Allied Health Sciences	Core Theory	Cardiac Catheterization	3	1	0	0	40	60	100	4
BCCT404-21	Allied Health Sciences	Core Theory	Cardiac Medical Instrumentation	3	1	0	0	40	60	100	4
BCCT405-21	Allied Health Sciences	Core Practical/ Lab	Basic Patient care	0	0	2	0	60	40	100	2
BCCT406-21	Allied Health	Core Practical/ Lab	Basics Cardiac	0	0	4	0	60	40	100	2

	Sciences		Evaluation								
BCCT407-21	Allied Health Sciences	Core Practical/ Lab	Cardiac Catheterization	0	0	4	0	60	40	100	2
BCCT408-21	Allied Health Sciences	Core Practical/ Lab	Cardiac Medical Instrumentation	0	0	4	0	60	40	100	2

*A course can either have four Hrs Lecture or Three Hrs Lecture + One Hrs Tutorial as per requirement

Semester		**Fifth (5th)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BXXX-501-21											
BXXX-502-21											
BXXX-503-21											
BXXX-504-21											

Semester		**Sixth (6th)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BXXX-601-21											
BXXX-602-21											
BXXX-603-21											
BXXX-604-21											

Semester		**Seventh (7th)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BXXX-701-21											
BXXX-702-21											
BXXX-703-21											
BXXX-704-21											

Semester		**Eighth (8th)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BXXX-801-21											
BXXX-802-21											
BXXX-803-21											
BXXX-804-21											

List of Elective *(Heading Font = Tahoma, Size = 16)*

Elective-I (if applicable) *(Heading Font = Tahoma, Size = 14)*

BXXX-XXX-22 *(Font = Tahoma, Size = 12)*
BXXX-XXX-22
BXXX-XXX-22
BXXX-XXX-22

Elective-II (if applicable) *(Heading Font = Tahoma, Size = 14)*

BXXX-XXX-22 *(Font = Tahoma, Size = 12)*
BXXX-XXX-22
BXXX-XXX-22
BXXX-XXX-22

Elective-III (if applicable) *(Heading Font = Tahoma, Size = 14)*

BXXX-XXX-22 *(Font = Tahoma, Size = 12)*
BXXX-XXX-22
BXXX-XXX-22
BXXX-XXX-22

Open Elective (if applicable) *(Heading Font = Tahoma, Size = 14)*

BXXX-XXX-22 *(Font = Tahoma, Size = 12)*
BXXX-XXX-22
BXXX-XXX-22
BXXX-XXX-22

Examination and Evaluation

Theory				
Sr. No.	**Evaluation Criteria**	**Weightage in Marks**		**Remarks**
1.	Mid Term / Sessional Tests	30	10	Internal Evaluation (XX Marks) MSTs, Quizzes, Assignments, Attendance etc., constitute internal evaluation. Average of two mid semester test will be considered for evaluation.
2.	Attendance	5	5	
3.	Assignments	5	5	
4.	End Semester Examination	60	30	External Evaluation
5.	**Total**	**100**	**50**	Marks May be rounded off to nearest integer

Practical			
Sr. No.	**Evaluation Criteria**	**Weightage in Marks**	**Remarks**
1.	Evaluation of Practical Record / Viva Voce / Attendance / Seminar / Presentation	30	Internal Evaluation
2.	Final Practical Performance + Viva Voce	20	External Evaluation
3.	**Total**	**50**	Marks May be rounded off to nearest integer

Question Paper Pattern for MST:

Roll No: **No. of Pages**

I. K. Gujral Punjab Technical University, Jalandhar

Department of Allied Health Sciences

Academic Session: -

Mid-Semester Test (I / II / III) (Regular / Reappear): -	**Xxxxxxx**	Date: -	**DD/MM/YYYY**
Programme: -	**Xxxxxxxx**	Semester: -	**XX Semester**
Course Code: -	**xxxx-xxx-YY**	Course: -	**Xxxxx**
Maximum Marks: -	**Xxx**	Time: -	**xx HH xx MM**

* Note: - Section A is Compulsory, Attempt any two questions from Section B and One Question from Section C.

Section: A		**Marks**	**COs**
1.		02	
2.		02	
3.		02	
4.		02	
Section: B		**Marks**	**COs**
5.			
6.			
7.			
Section: C		**Marks**	**COs**
8.			
9.			

Details of Course Objectives

CO1	Students will be able to learn the terminology of the subject and basic knowledge of cells, tissues, blood and to understand anatomy and physiology of human body.
CO2	Students will learn the etiology and pathogenesis of the various disease states.
CO3	Students shall be able to know the various types of application of computers in health care.
CO4	Students will be able to learn the terminology of the subject and basic knowledge of basic chemistry and biochemistry involved in physiology of human body.
CO5	Emphasis is placed on building familiarity with medical words through knowledge of roots, prefixes, and suffixes.

SEMESTER-I

Semester		**First (1st)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BCCT101-21	Allied Health Sciences	Core Theory	Basics of Anatomy-I	3	1	0	0	40	60	100	4

Pre-requisite: -

Course Objectives :-

The Course aims to provides a learning and understanding and evaluating and issues with the general anatomical structures of the human body.

Course Outcomes :-

CO1 - Students will be able to learn the terminology of the subject and basic knowledge of cells, tissues, blood and to understand anatomy and physiology of human body.

CO2 - Students will understand the structure and function of organs and organ systems in normal human body.

CO3 - Students will learn various mechanism of contraction and relaxation.

	Hours
Unit I Introduction: Definition of anatomy and its divisions, Terms of location, positions and planes. • Cell and its organelles, Tissues & its classification, Glands. Cardiovascular System: Arteries & veins, Capillaries & arterioles, Heart- size, location, Cardiac chambers, blood supply of heart, pericardium, Systemic & pulmonary circulation, Major blood vessels of Heart- Aorta, pulmonary artery, common carotid artery, subclavian artery, axillary artery, brachial artery, common iliac artery, femoral artery, Inferior vena cava, portal circulation, great saphenous vein.	12
Unit II Lymphatic System: Lymph & Lymph vessels, Structure of lymph node, names of regional lymphatics, auxiliary and inguinal lymph, nodes. Respiratory system: Parts of Respiratory system; Structure of nose, nasal	12

cavity, larynx, trachea, lungs, pleura, bronchopulmonary segments.

Unit III

Gastro-intestinal System: Parts of GIT, structure of tongue, pharynx, 12 salivary glands, Location & Gross structure of Oesophagus, stomach, intestine (small and large), liver, gall bladder, pancreas, spleen.

Unit IV

Musculoskeletal system: Structure of Bone & its types, Joints- 10 Classification of joints with examples; details of synovial joint, Bones & joints of upper limb, lower limb and their movements, Axial skeleton & appendicular skeleton, Skull, spine & its movements, intervertebral disc, Muscles & its types, Muscles of the upper limb, lower limb, trunk and neck.

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	Ross & Wilson Anatomy and Physiology	Anne Waugh, Allison Grant	Churchill Livingstone
2	Principles of Anatomy & Physiology	Tortora & Bryan	WILEY
3	Kathleen J.W. Wilson	Anatomy and Physiology in Health and Illness	Churchill Livingstone, New York
4	Arthur C,Guyton and John.E	Text book of Medical Physiology	Hall. Miamisburg, OH, U.S.A

Semester		**First (1st)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BCCT102-21	Allied Health Sciences	Core Theory	Basics of Physiology-I	3	1	0	0	40	60	100	4

Pre-requisite: -

Course Objectives :-

To teach the fundamental concepts of Human Physiology.

Course Outcomes :-

CO1 - Students will be able to learn the basic functions of cells, tissues, blood and understand physiology of human body.
CO2 - Students will understand the structure and function of organs and organ systems in normal human body.

Unit-

I Cardiovascular System: Heart-Physiological Anatomy, Nerve supply, Properties of cardiac muscle, Cardiac Cycle-Events –systole, diastole, Cardiac Output-Definition and factors affecting it, Heart sounds-normal heart sounds, its causes, areas of auscultations, Blood Pressure-Definition, normal value, Physiological variations, its measurement, ECG- normal waves, Shock-Definition, Types.

II Blood:
Red Blood Cells- Functions, count, Physiological variations. Erythropoisis-stages, Hemoglobin-Functions, Physiological variations, White Blood cells-Functions, count, morphology, Platelets-count, morphology, functions. Hemostasis-Definition, Mechanism, clotting factors, Blood groups-ABO system, Rh system, Blood transfusion-Indication, transfusion reactions, Anaemias-classification, morphological and Etiological, effects of anaemia on body.

III Respiratory System: Physiological Anatomy, Functions of the respiratory system, Types of respiration, respiratory membrane, Lung volumes and capacities, vital capacity and factors affecting it, Transport of Oxygen- Forms of transportation, Oxy-hemoglobin dissociation curve and factors affecting it, Transport of Carbon-Dioxide- Forms of transportation, Hypoxia-Definition, types, effects of hypoxia, Cyanosis-Definition and types, Artificial Respiration- CPR

IV Gastrointestinal System: Physiological Anatomy, functions of GIT, Salivary Gland- functions of saliva, Stomach- structure and functions, Gastric secretions- composition, functions, Mechanism, Pancreas- structure, functions, composition of Pancreatic juice, Liver-Functions of liver, Bile-Composition, functions,Jaundice- Types and its causes,Gall Bladder- Functions, Intestine- Movements of small and large intestine, Digestion and Absorption of Carbohydrates, Protiens, Fats, Hormones of GIT- Functions of Gastrin, Secretin, CCK-PZ.

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	Ross & Wilson Anatomy and Physiology	Anne Waugh, Allison Grant	Churchill Livingstone
2	Principles of Anatomy & Physiology	Tortora & Bryan	WILEY
3	Kathleen J.W. Wilson	Anatomy and Physiology in Health and Illness	Churchill Livingstone, New York
4	Arthur C,Guyton and John.E	Text book of Medical Physiology	Hall. Miamisburg, OH, U.S.A

Semester		**First (1st)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BCCT103-21	Allied Health Sciences	Core Theory	Basics of Biochemistry-I	3	1	0	0	40	60	100	4

Pre-requisite: -

Course Objectives :-

To teach the fundamental concepts of cell biology & biochemistry.

Course Outcomes :-

CO1 - Students will be able to learn the terminology of the subject and basic knowledge of basic chemistry and biochemistry involved in physiology of human body.

CO2 - They will be able to understand the reports generated by laboratory and shall be able to convey the surgeon about any critical alert.

Unit		**Contact Hours**
I	Cell: Morphology, structure & functions of cell, cell membrane, Nucleus, chromatin, Mitochondria, Endoplasmic Reticulum, Ribosomes. Carbohydrates: Definition, chemical structure, functions, sources, classifications, Monosaccharides, Disaccharides, Polysaccharides, mucopoloysaccharide and its importance, glycoproteins Lipids: Definition, function, sources, classification, simple lipid, compound lipid, derived lipid, unsaturated and saturated fatty acid. Essential fatty acids and their importance, Blood lipids and their implications, cholesterol with its importance.	12
II	Proteins :Definition, sources, amino acids, structure of protein, their classification, simple protein, conjugated protein, derived proteins and their properties.	14

	Enzymes: Definitions, mechanism of action, factors affecting enzyme action, enzyme of clinical importance.	
III	Nutrition 1) Vitamins: Types, functions and role. 2) Principal minerals and their functions(Ca, P, Mg, Na, K, Cl) 3) Balanced diet, Diet for Chronically and terminally ill patients, post operative patients Bioenergetics: Energy rich compounds, Respiratory chain and Biological oxidation.	10
IV	Carbohydrate Metabolism: Glycolysis, TCA cycle, Glycogen metabolism, Gluconeogenesis, Maintenance of Blood Glucose. Diabetes Mellitus and its complications.	16

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	Lehninger	Principles of Biochemistry	W.H. Freeman & Company, New York
2	Berg, J.M., Tymoczko, J.L. and Stryer L	Biochemistry	W.H. Freeman & Company, New York
3	Voet, D.J., Voet, J.G. and Pratt, C.W	Principles of Biochemistry	John Wiley & Sons, New York
4	Murray, R.K., Granner, D.K., Mayes and P.A., Rodwell, V.W	Harper's Biochemistry	Lange Medical Books/McGraw Hill

Semester		**First (1st)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BCCT104-21	Allied Health Sciences	Core Practical/ Lab	Basics of Anatomy-I	0	0	4	0	60	40	100	2

Pre-requisite: -

Course Objectives :-

To make the students learn practical aspects of Human Anatomy.

Course Outcomes :-

CO1 - Students will be able to learn the terminology of the subject and basic knowledge of cells, tissues, blood and to understand anatomy and physiology of human body.
CO2 - Students will understand the structure and function of organs and organ systems in normal human body.

CO3 - Students will learn various mechanism of contraction and relaxation.

Unit I Histology: • Epithelium: Simple (squamous, cuboidal, columnar, ciliated), Stratified, Transitional • Bone, muscles (skeletal, smooth, cardiac) • Cartilage (hyaline, elastic, fibro cartilage). • Connective Tissue (loose and dense). • Arteries (large & medium sized), Veins.

- Demonstration of various parts of body
- Demonstration of tissues of body
- Demonstration of parts of digestive system
- Demonstration of parts of respiratory system
- Demonstration of parts of skin
- Demonstration of various parts of circulatory system (Demonstration from models)
- Demonstration of structural differences between skeletal,smooth and cardiac muscles (permanent mounts)
- Demonstration of various bones and joints
- To study circulatory system from charts and transverse section(TS) of artery and vein from permanent slides.
- To study digestive system from charts and TS of liver, spleenand pancreas from permanent slides.
- To study various body fluids.

Note: Demonstrations can be done with the help of models, charts and histological slides

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	Ross & Wilson Anatomy and Physiology	Anne Waugh, Allison Grant	Churchill Livingstone
2	Principles of Anatomy & Physiology	Tortora & Bryan	WILEY
3	Kathleen J.W. Wilson	Anatomy and Physiology in Health and Illness	Churchill Livingstone, New York
4	Arthur C,GuytonandJohn.E	Text book of Medical Physiology	Hall. Miamisburg, OH, U.S.A

Semester		First (1st)									
Course Code	Group	Course Type	Course Name / Title	Lord Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicable)	Internal	External		
BCCT105-21	Allied Health Sciences	Core Practical/ Lab	Basics of Physiology-I	0	0	4	0	60	40	100	2

Pre-requisite: -

Course Objectives :-

To make the students learn practical aspects of Human Physiology.

Course Outcomes :-

CO1 - Students will be able to learn the basic functions of cells, tissues, blood and understand physiology of human body.
CO2 - Students will understand the structure and function of organs and organ systems in normal human body.

Contents

- Examination of blood film for various blood cells from stained slides.
- Blood pressure estimation
- Estimation of Hemoglobin Concentration
  - Determination of Bleeding Time and Clotting Time
  - Determination of Blood Groups
  - Recording of normal Blood Pressure
  - Clinical Examination of Arterial Pulse
  - Determination of Vital Capacity

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	Ross & Wilson Anatomy and Physiology	Anne Waugh, Allison Grant	Churchill Livingstone
	Principles of Anatomy		

2	& Physiology	Tortora & Bryan	WILEY
3	Kathleen J.W. Wilson	Anatomy and Physiology in Health and Illness	Churchill Livingstone, New York
4	Arthur C, Guyton and John.E	Text book of Medical Physiology	Hall. Miamisburg, OH, U.S.A

Semester		**First (1st)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BCCT106-21	Allied Health Sciences	Core Practical/ Lab	Basics of Biochemistry-I	0	0	4	0	60	40	100	2

Pre-requisite: -

Course Objectives :-

To make the students learn practical aspects of Biochemistry.

Course Outcomes :-

CO1 - Students will be able to learn the terminology of the subject and basic knowledge of basic chemistry and biochemistry involved in physiology of human body.

CO2 - They will be able to understand the reports generated by laboratory and shall be able to convey the surgeon about any critical alert.

Contents

1. Safety measures in laboratories.
2. Preparation of normal and molar solutions.
3. Preparation of buffers.
4. Determination of pKa of acetic acid and glycine.
5. Qualitative tests for carbohydrates, lipids, amino acids, proteins and nucleic acids.
6. Separation of amino acids/ sugars/ bases by thin layer chromatography.
7. Estimation of vitamin C.

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	D. Shaheen	Physical Biochemistry	Wiley Blackwell Publishers
2	T. G. Coopers	The Tools of Biochemistry	Wiley India Pvt. Ltd.
3	Voet, D.J., Voet, J.G. and Pratt, C.W	Principles of Biochemistry	John Wiley & Sons, New York
4	Murray, R.K., Granner, D.K., Mayes and P.A., Rodwell, V.W	Harper's Biochemistry	Lange Medical Books/McGraw Hill

Semester		**First (1st)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BTHU-103-18	Allied Health Sciences	Ability Enhancement Compulsory Course (AECC)	English	1	0	0	0	40	60	100	1

Pre-requisite: -

Course Objectives :-

To learn effective communication both oral & written.

Course Outcomes :-

CO1 - The students will be able to appreciate communication skills as these are important to everyone - those are how we give and receive information and convey our ideas and opinions with those around us.

CO2 - The students trained with this course will be able to deal with patients, their fellows and seniors, face to face, in a better way.

Unit		
I	Theory of Communication Types and modes of Communication	4
II	Language of Communication Verbal and Non-verbal (Spoken & verbal), Personal, Social and Business Barriers and Strategies, Intra-personal, Inter-personal and Group communication	6
III	**Reading and Understanding** Close Reading, Comprehension, Summary Paraphrasing,	10

	Analysis and Interpretation, Translation(from Hindi/Punjabi to English and vice-versa), Literary/Knowledge Texts	
IV	Documenting, Report Writing, Making Notes, Letter Writing	10

Reference Books

1. *Fluency in English* - Part II, Oxford University Press, 2006.
2. *Business English*, Pearson, 2008.
3. *Language, Literature and Creativity*, Orient Blackswan, 2013.
4. *Language through Literature* (forthcoming) ed. Dr. Gauri Mishra, DrRanjana Kaul, Dr Brati Biswas
5. *On Writing Well*. William Zinsser. Harper Resource Book. 2001
6. *Study Writing.* Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

Semester		**First (1st)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BTHU-104-18	Allied Health Sciences	Ability Enhancement Compulsory Course (AECC)	English	0	0	2	0	30	20	50	1

Pre-requisite: -

Course Objectives :-

To learn effective communication both oral & written.

Course Outcomes :-

CO1 - The students will be able to appreciate communication skills as these are important to everyone - those are how we give and receive information and convey our ideas and opinions with those around us.

CO2 - The students trained with this course will be able to deal with patients, their fellows and seniors, face to face, in a better way.

I **Interactive practice sessions in Language Lab on Oral Communication**

Listening Comprehension

Self-Introduction, Group Discussion and Role Play

Common Everyday Situations:

Conversations and Dialogues

Communication at Workplace

Interviews
Formal Presentations, Effective Communication/ Mis-communication
Public Speaking

Reference Books

1. *Fluency in English* - Part II, Oxford University Press, 2006.
2. *Business English*, Pearson, 2008.
3. Practical English Usage. Michael Swan. OUP. 1995.
4. *Communication Skills*. Sanjay Kumar and Pushp Lata. Oxford UniversityPress. 2011.
5. *Exercises in Spoken English*. Parts. I-III. CIEFL, Hyderabad. Oxford UniversityPress

Semester		**First (1st)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
HVPE-101-18	Allied Health Sciences	Ability Enhancement Compulsory Course (AECC)	Human Values, De-addiction & Traffic Rules	3	0	0	0	40	60	100	3

Pre-requisite: -

Course Objectives :-

To develop a sense of social responsibility, traffic rules and about menace of drugs.

Course Outcomes :-

CO1 – Students will understand Happiness and Prosperity in todays life.
CO2 - The students will Understand values and harmony in human-human relationship.
CO3 – Students will learn basis for humanistic education, humanistic constitution and humanistic universal order.

Unit		**Hours**
I	**Course Introduction – Need, Basic Guidelines, Content and Process for Value Education** Understanding the need, basic guidelines, content and process for Value Education Self Exploration–what is it? – its content and process; 'Natural Acceptance' and Experiential Validation-as the mechanism for self exploration Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facilities- the basic requirements for 18ulfilment of aspirations of every human being	6

	with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to 18ulfil the above human aspirations: understanding and living in harmony at various levels	
II	**Understanding Harmony in the Human Being – Harmony in Myself!** Understanding human being as a co-existence of the sentient 'I' and the material 'Body' Understanding the needs of Self ('I') and 'Body' – *Sukh* and *Suvidha* Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) Understanding the characteristics and activities of 'I' and harmony in 'I' Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure *Sanyam* and *Swasthya* Practice Exercises and Case Studies will be taken up in Practice Sessions.	6
III	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** Understanding harmony in the Family- the basic unit of human interaction Understanding values in human-human relationship; meaning of *Nyaya* and program for its 18ulfilment to ensure *Ubhay-tripti*; Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship Understanding the meaning of *Vishwas*; Difference between intention and competence Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sah-astitva* as comprehensive Human Goals Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj),* Universal Order (*SarvabhaumVyawastha*)- from family to world family! Practice Exercises and Case Studies will be taken up in Practice Sessions	6
IV	**Understanding Harmony in the Nature and Existence – Whole existence as Co-existence** Understanding the harmony in the Nature	4

Interconnectedness and mutual 19ulfilment among the four orders of nature-
recyclability and self-regulation in nature
Understanding Existence as Co-existence (*Sah-astitva*) of mutually
interacting units in all-pervasive space
Holistic perception of harmony at all levels of existence
Practice Exercises and Case Studies will be taken up in Practice
Sessions.

V **Implications of the above Holistic Understanding of Harmony on Professional** 6

Natural acceptance of human values
Definitiveness of Ethical Human Conduct
Basis for Humanistic Education, Humanistic Constitution and Humanistic
Universal Order
Competence in professional ethics:
Ability to utilize the professional competence for augmenting universal human order,

Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems,

Ability to identify and develop appropriate technologies
and management patterns for above production systems.

Case studies of typical holistic technologies, management models and
production systems
Strategy for transition from the present state to Universal Human Order:
At the level of individual: as socially and ecologically responsible
engineers, technologists
and managers

b) At the level of society: as mutually enriching institutions and organizations

Reference Books

Text Book

1. R R Gaur, R Sangal, G P Bagaria, 2009, *A Foundation Course in Value Education*
2. Ivan Illich, 1974, *Energy & Equity,* The Trinity Press, Worcester, and HarperCollins, USA
3. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond& Briggs, Britain.
4. A Nagraj, 1998, *Jeevan Vidya ek Parichay,* Divya Path Sansthan, Amarkantak.
5. Sussan George, 1976, *How the Other Half Dies,* Penguin Press. Reprinted 1986, 1991
6. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Purblishers.
7. A.N. Tripathy, 2003, *Human Values*, New Age International Publishers.

Relevant CDs, Movies, Documentaries & Other Literature:

1. Value Education website, *http://uhv.ac.in*

2. Story of Stuff, *http://www.storyofstuff.com*

3. Al Gore, *An Inconvenient Truth*, Paramount Classics, USA

4. Charlie Chaplin, *Modern Times*, United Artists, USA

5. IIT Delhi, *Modern Technology – the Untold Story*

Semester		**First (1st)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
HVPE-102-18	Allied Health Sciences	Ability Enhancement Compulsory Course (AECC)	Human Values, De-addiction & Traffic Rules (Lab/ Seminars)	0	0	1	0	25	**	25	1

Pre-requisite: -

Course Objectives :-

To develop a sense of social responsibility, traffic rules and about menace of drugs.

Course Outcomes :-

CO1 – Students will understand Happiness and Prosperity in todays life.
CO2 - The students will understand values and harmony in human-human relationship.
CO3 – Students will learn basis for humanistic education, humanistic constitution and humanistic universal order.

- One each seminar will be organized on Drug De-addiction and Traffic Rules.
- Eminent scholar and experts of the subject will be called for the Seminar atleast once during the semester. It will be binding for all the students to attend the seminar.

Semester		**First (1st)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BMPD-102-18	Allied Health Sciences	Ability Enhancement Compulsory Course (AECC)	Mentoring & Professional Development	0	0	1	0	25	**	25	1

Pre-requisite: -

Course Objectives :-

To learn the lifelong learning skills.

Course Outcomes :-

CO1 – Students will understand about presentations.
CO2 – Students will lose stage fear.
CO3 – Students will learn about group discussion.

I **Part-A (Class Activities)**

1. Expert and video lectures
2. Aptitude Test
3. Group Discussion
4. Quiz (General/Technical)
5. Presentations by the students
6. Team building Exercises

7* A part of above six points practicals on Fundamentals of Computers are also added as per Annexure-I

II **Part-B (Outdoor Activities)**

1. Sports/NSS/NCC
2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE,

CSI,
Cultural Club,
etc.

Evaluation shall be based on rubrics for Part – A & B

Mentors/Faculty incharges shall maintain proper record student wise of eachactivity conducted and the same shall be submitted to the department.

SEMESTER II

Semester		Second (2nd)									
Course Code	Group	Course Type	Course Name / Title	Lord Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicable)	Internal	External		
BCCT201-21	Allied Health Sciences	Core Theory	Basics of Anatomy-II	3	1	0	0	40	60	100	4

Pre-requisite: -

Course Objectives :-

The Course aims to provides a learning and understanding and evaluating and issues with the general anatomical structures of the human body.

Course Outcomes :-

CO1 - Students will be able to learn the terminology of the subject and basic knowledge of cells, tissues, blood and to understand anatomy and physiology of human body.
CO2 - Students will understand the structure and function of organs and organ systems in normal human body.

CO3 - Students will learn various mechanism of contraction and relaxation.

Unit

I Urinary System: Parts of Urinary system, location and gross structure ofkidney, ureter, urinary bladder, urethra.

II Reproductive system: Parts of male reproductive system, gross structure of testis, vas deferens, epididymis, prostate, Parts of female reproductive system, gross structure of uterus, ovary, fallopian tube, mammary gland.

III Endocrine glands: Name of all endocrine glands, gross structure & functions of pituitary gland, adrenal gland, thyroid gland and parathyroid gland.

IV Nervous system: Neuron, classification of NS, Meninges, ventricles, CSF, Gross features of cerebrum, midbrain, pons, medulla oblongata, cerebellum, name of basal nuclei, Blood supply of brain, cranial nerves, Spinal cord and spinal nerves, Autonomic nervous system, Visual & auditory pathways.
Sensory Organs: Skin & its appendages, Structure of eye & lacrimal apparatus, name of extraocular muscles. Structure of ear: external, middle & inner ear.

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	Ross & Wilson Anatomy and Physiology	Anne Waugh, Allison Grant	Churchill Livingstone
2	Principles of Anatomy & Physiology	Tortora & Bryan	WILEY
3	Kathleen J.W. Wilson	Anatomy and Physiology in Health and Illness	Churchill Livingstone, New York
4	Arthur C,Guyton and John.E	Text book of Medical Physiology	Hall. Miamisburg, OH, U.S.A

Semester		Second (2nd)									
Course Code	Group	Course Type	Course Name / Title	Lord Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicable)	Internal	External		
BCCT202-21	Allied Health Sciences	Core Theory	Basics of Physiology-II	3	1	0	0	40	60	100	4

Pre-requisite: -

Course Objectives :-

To teach the fundamental concepts of human physiology.

Course Outcomes :-

CO1 - Students will be able to learn the basic functions of cells, tissues, blood and understand physiology of human body.
CO2 - Students will understand the structure and function of organs and organ systems in normal human body.

Unit	
I	Excretory System: Kidneys-structure of nephron, functions of kidney Glomerular filtration Rate(GFR) and factors affecting it, Counter Current Mechanism, Bladder-its innervation, micturition reflex
II	Reproductive System: Male Reproductive System-Stages of spermatogenesis, function of Testosterone, Female Reproductive System-Ovulation, menstrual cycle, functions of Estrogen and progesterone

III Central Nervous System: Structure of neuron, functions of nervous system, Classification and properties of nerve fibres, Synapse- structure and types, Receptors-Definition, classification, properties, Reflex Arc, Ascending and Descending tracts- names and functions, Functions of Hypothalamus, Functions of Cerebellum and Basal Ganglia, Functions of Cerebral Cortex, Autonomic Nervous System- Actions of sympathetic and parasympathetic system, and their comparison., Special Senses-Eye- structure, functions of different parts, Visual acuity, Refractive errors Ear- structure, functions, General mechanism of hearing.

IV Nerve Muscle Physiology: Classification of Muscle, structure of skeletal
muscle, Neuromuscular Junction, Excitation Contraction Coupling

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	Ross & Wilson Anatomy and Physiology	Anne Waugh, Allison Grant	Churchill Livingstone
2	Principles of Anatomy & Physiology	Tortora & Bryan	WILEY
	Kathleen J.W. Wilson	Anatomy and Physiology in Health and Illness	Churchill Livingstone, New York
4	Arthur C,Guyton and John.E	Text book of Medical Physiology	Hall. Miamisburg, OH, U.S.A

Semester		**Second (2nd)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BCCT203-21	Allied Health Sciences	Core Theory	Basics of Biochemistry-II	3	1	0	0	40	60	100	4

Pre-requisite: -

Course Objectives :-

To teach the fundamental concepts of cell biology & biochemistry.

Course Outcomes :-

CO1 - Students will be able to learn the terminology of the subject and basic knowledge of basic chemistry and biochemistry involved in physiology of human body.

CO2 - They will be able to understand the reports generated by laboratory and shall be able to convey the surgeon about any critical alert.

Unit		
I	**Nucleic Acids & its metabolism:** Nucleosides, Nucleotides, Purines, Pyrimidines, Structure of DNA & its types (A, B & Z DNA's), RNA & its types, Metabolism of Purines & Pyrimidines and their disorders.	8
II	**Metabolism of Fatty Acids:** Digestion, absorption of lipids. Chylomicrons, Oxidation of Fatty Acids. Disorders of Fat metabolism, Fatty Liver & its causes. Ketosis & its salient features, causes and diagnosis of Ketosis. Lipoproteins, classification & types of Lipoproteins, LDL & HDL, their functions & clinical applications. Hyperlipidemias and Cardiovascular Diseases.	12

III	**Metabolism of Amino Acids:** Formation of ammonia, Transamination, Biological significance & clinical significance of Transamination. Transdeamination: oxidative & non-oxidative deamination, Urea Cycle, disorders of urea cycle.	10
IV	**Clinical Biochemistry:** Water and Electrolyte, Fluid compartment, daily intake and output sodium and potassium balance Nerve tissue: Neuro transmitters and nerve activity. Hormones: Actions of Hormone Insulin, Glucagon, Thyroid and Parathyroid hormones, Cortical hormones. Acid Base Balance , role of lungs and kidneys,– Regulation of blood pH, acidosis, Alkalosis, Physical Chemistry: Osmosis, Dialysis, Donann membraneequilibirium Liver, Gastric, Pancreatic and Kidney functions tests.	12

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	D.M. Vasudevan, S. Sreekumari and KannanVaidyanathan	Textbook of Biochemistry forMedical Students	The Health Science Publishers
2	Murray, R.K., Granner, D.K., Mayes and P.A., Rodwell, V.W	Harper's Biochemistry	Lange Medical Books/McGraw Hill
3	Berg, J.M., Tymoczko, J.L. and Stryer L	Biochemistry	W.H. Freeman & Company, New York
4	Lehninger	Principles of Biochemistry	W.H. Freeman & Company,New York

Semester		**Second (2nd)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BCCT204-21	Allied Health Sciences	Core Practical/ Lab	Basics of Anatomy-II	0	0	4	0	60	40	100	2

Pre-requisite: -

Course Objectives :-

To make the students learn practical aspects of human anatomy.

Course Outcomes :-

CO1 - Students will be able to learn the terminology of the subject and basic knowledge of cells, tissues, blood and to understand anatomy and physiology of human body.
CO2 - Students will understand the structure and function of organs and organ systems in normal human body.

CO3 - Students will learn various mechanism of contraction and relaxation.

- Demonstration of parts of Urinary system
- Demonstration of parts of Reproductive system
- Demonstration of parts of Nervous System: Brainand Spinal Chord, Cranial & Spinal Nerves
- Demonstration of various Sensory Organs: Eye, Ear (Demonstration frommodels)

Note: Demonstrations can be done with the help of models, chartsand histological slides

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	Ross & Wilson Anatomy and Physiology	Anne Waugh, Allison Grant	Churchill Livingstone
2	Principles of Anatomy & Physiology	Tortora & Bryan	WILEY
	Kathleen J.W. Wilson	Anatomy and Physiology in Health and Illness	Churchill Livingstone, New York
4	Arthur C,Guyton and John.E	Text book of Medical Physiology	Hall. Miamisburg, OH, U.S.A

Semester		Second (2nd)									
Course Code	Group	Course Type	Course Name / Title	Lord Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicable)	Internal	External		
BCCT205-21	Allied Health Sciences	Core Practical/ Lab	Basics of Physiology-II	0	0	4	0	60	40	100	2

Pre-requisite: -

Course Objectives :-

To make the students learn practical aspects of human physiology.

Course Outcomes :-

CO1 - Students will be able to learn the basic functions of cells, tissues, blood and understand physiology of human body.
CO2 - Students will understand the structure and function of organs and organ systems in normal human body.

Sr. No.		Hours
1.	To Examine Cranial nerve	2
2.	To Examine Photopupillary reflex	2
3.	To Examine Deep tendon reflex	2
4.	To Examine Superficial Reflex	2
5.	To Examine Sensory system	2
6.	To Examine the Motor system	2
7.	To Examine Eye Reflex	2
8.	To study Histology slides of Different types of Muscle tissue	2
9.	To identify the Urinary System organs using models and describe the function of the kidney	2
10.	To Examine Hearing	2

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	Ross & Wilson Anatomy and Physiology	Anne Waugh, Allison Grant	Churchill Livingstone
2	Principles of Anatomy & Physiology	Tortora & Bryan	WILEY
	Kathleen J.W. Wilson	Anatomy and Physiology in Health and Illness	Churchill Livingstone, New York
4	Arthur C,Guyton and John.E	Text book of Medical Physiology	Hall. Miamisburg, OH, U.S.A

Semester		**Second (2nd)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BCCT206-21	Allied Health Sciences	Core Practical/ Lab	Basics of Biochemistry-II	0	0	4	0	60	40	100	2

Pre-requisite: -

Course Objectives :-

To make the students learn practical aspects of biochemistry.

Course Outcomes :-

CO1 - Students will be able to learn the terminology of the subject and basic knowledge of basic chemistry and biochemistry involved in physiology of human body.

CO2 - They will be able to understand the reports generated by laboratory and shall be able to convey the surgeon about any critical alert.

Sr. No.	
I	To visit Clinical biochemistry laboratory observe and learn about: a. What testsare being performed in clinical biochemistry laboratory? b. Basics of various routine laboratory tests performed e.g. To understand briefly the interpretation of various tests report 1. Liver function tests 2. Renal function tests 3. Urine sugar and protein level

Analysis of Normal
Urine Composition of
urine
Procedure for routine screening
Urinary screening for inborn errors of
metabolism Common renal disease
Urinary calculus
Urine examination for detection of abnormal
constituents Interpretation and Diagnosis through
charts
Liver Function
tests Lipid Profile
Renal Function
test Cardiac
markers
Blood gas and Electrolytes

Semester		Second (2nd)									
Course Code	Group	Course Type	Course Name / Title	Lord Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicable)	Internal	External		
EVS102-18	Allied Health Sciences	Ability Enhancement Compulsory Course (AECC)	Environmental Studies	2	0	0	0	40	60	100	1

Pre-requisite: -

Course Objectives :-

To learn the basics of environmental issues at local and national level through literature and general awareness.

Course Outcomes :-

CO1 - Students will enable to understand environmental problems.
CO2 - The students will apply interdisciplinary approach to understand key environmental issues and critically analyze them to explore the possibilities to mitigate these problems.
CO3 - Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
CO4 - Students will gain practical knowledge by visiting wildlife areas and environmental institutes.

Unit		
I	Introduction to Environmental Studies Multidisciplinary nature of Environmental Studies: Scope & Importance Need for Public Awareness Ecosystems Concept of an Ecosystem: Structure & functions of an ecosystem (Producers, Consumers & Decomposers) Energy Flow in anecosystem: Food Chain, Food web and Ecological Pyramids Characteristicfeatures, structure & functions of following Ecosystems: • Forest Ecosystem • Aquatic Ecosystem (Ponds, Lakes, River & Ocean)	4
II	Natural Resources Renewable & Non-renewable resources Forest Resources: Their uses, functions & values (Biodiversity conservation, role in climate change, medicines) & threats (Overexploitation, Deforestation, Timber extraction, Agriculture Pressure), Forest Conservation Act Water Resources: Their uses (Agriculture, Domestic & Industrial), functions & values, Overexploitation and Pollution of Ground & Surface water resources (Case study of Punjab), Water Conservation, Rainwater Harvesting, Land Resources: Land as a resource; Land degradation, soil erosion and desertification. Energy Resources: Renewable & non-renewable energy resources, use of alternate energy resources (Solar, Wind, Biomass, Thermal), Urban problems related to Energy	8
III	Biodiversity & its conservation Types of Biodiversity: Species, Genetic &Ecosystem India as a mega biodiversity nation, Biodiversity hot spots andbiogeographic regions of India Examples of Endangered & Endemic species of India, Red data book Environmental Pollution & Social Issues Types, Causes, Effects & Control of Air, Water, Soil & Noise Pollution Nuclear hazards and accidents & Health risks Global Climate Change: Global warming, Ozone depletion, Acid rain, Melting of Glaciers & Ice caps, Rising sea levels Environmental disasters: Earthquakes, Floods, Cyclones, Landslides	8
IV	Field Work Visit to a National Park, Biosphere Reserve, Wildlife Sanctuary Documentation & preparation of a Biodiversity (flora & fauna) register of campus/river/forest Visit to a local polluted site : Urban/Rural/Industrial/Agricultural Identification & Photography of resident or migratory birds, insects (butterflies) Public hearing on environmental issues in a village	16

Reference Books

1. Carson, R. 2002. *Silent Spring*. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R.1993. *This Fissured Land: An Ecological History of India*. Univ. of

Signature of Convenor (BOS) Signature of Chairman (BOS)

California Press.
3. Gleeson, B. and Low, N. (eds.) 1999. *Global Ethics and Environment*, London, Routledge.
4. Gleick, P. H. 1993. *Water in Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. *Principles of Conservation Biology*. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science,* 339: 36--- 37.
7. McCully, P. 1996. *Rivers no more: the environmental effects of dams*(pp. 29---64). ZedBooks.
8. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum, E.P., Odum, H.T. & Andrews, J. 1971. *Fundamentals of Ecology*. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment*. Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. *Environment*. 8th edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India*. *Tripathi 1992*.
14. Sengupta, R. 2003. *Ecology and economics*: An approach to sustainable development. OUP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology*: *Voices from the Tropics*. John Wiley & Sons.
17. Thapar, V. 1998. *Land of the Tiger*: *A Natural History of the Indian Subcontinent*.
18. Warren, C. E. 1971. *Biology and Water Pollution Control*. WB Saunders.
19. Wilson, E. O. 2006. *The Creation: An appeal to save life on earth*. New York: Norton.
20. World Commission on Environment and Development. 1987. *Our Common Future*. Oxford University Press.

SYLLABUS OF SEMESTER 3rd

Semester		Third (3rd)									
Course Code	Group	Course Type	Course Name / Title	Lord Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicable)	Internal	External		
BCCT301-21	Allied Health Sciences	Core Theory	Anatomy and Physiology of Cardiovascular system	3	1	0	0	40	60	100	4

Pre-requisite: -

Course Objectives :-

The Course aims to provides a learning and understanding and evaluating and issues with the general anatomical structures of the human body.

Course Outcomes :-

CO1 - The objective of studying CVS is to learn the gross anatomy and structural features of cardiac chambers along with their functions.

CO2 - Students will understand various aspects of coronary vascular system.

CO3 - Students will learn various mechanism of contraction and relaxation.

UNIT- I:

- **Anatomy of the heart and great vessels**

UNIT II:

- **Gross anatomy and structural features of cardiac chambers**
  - Atrium
  - Ventricle
  - AV junction
  - Heart valves
  - Specialized conduction tissues
- **Conduction system**
  - Sinus node
  - Internodal tracts
  - AV node
  - Bundle of His
- **Systemic circulation**
  - Arterial system
  - Venous system
  - Lymphatic system
  - Tissue perfusion and microcirculation
- **Pulmonary circulation**
  - Pulmonary artery
  - Pulmonary veins
  - Bronchial artery
  - Cerebral circulation
  - Renal circulation

UNIT- III:

1. Innervations of the heart

- Sympathetic
- Parasympathetic
- Sensory

2. coronary vascular system

- Coronary arteries
- Myocardial capillary bed
- Venous drainage
- Lymphatic drainage

3. Cardiac cycle

- Mechanical events
- Heart sounds

4. Cardiac output
• Assessment of cardiac output
• Ficks principle
• Thermal dilution and indicator dilution methods
Cardiac excitation and contraction
• Mechanism of contraction
• Nodal electricity

5. Hematology and coagulation physiology of blood components
• Blood groups
• Blood transfusion
• Hemostasis

Practicals:
To study the anatomy and physiology of heart and its parts.

Reference Books (latest edition)
1. Basic Pathology Robbins Saunders an imprint of Elsevier Inc., Philadelphia, USA

2. Text book of Pathology Harsh Mohan Jaypee Brothers, New Delhi

3. Practical Pathology P. Chakraborty, Gargi Chakraborty New Central Book Agency, Kolkata

4. Text Book of Haematology Dr. Tejinder Singh Arya Publications, Sirmour (H.P)

5. Text Book of Medical Laboratory Technology Praful Godkar, Bhalani Publication House, Mumbai

6. Text Book of Medical Laboratory Technology RamanikSood

Semester		Third (3rd)									
Course Code	Group	Course Type	Course Name / Title	Lord Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicable)	Internal	External		
BCCT302-21	Allied Health Sciences	Core Theory	Applied Microbiology	3	1	0	0	40	60	100	4

Pre-requisite: -

Course Objectives :-

The Course aims to provides a learning and understanding various healthcare associated in infections.

Course Outcomes :-

CO1 – To understand the importance and various aspect of sterilization and disinfection**.**

CO2 – To learn about varieties of bacteria resistant to drug.

CO3 – To understand various healthcare associated in infections.

Unit I.

Sterilization and disinfection, Sterilization and disinfection - classification, principle, methods, Central sterile supply department

Unit II.

Importance of sterilization and disinfection, Disinfection of instruments used in patient care, Disinfection of patient care unit, Infection control measures for ICUs

Unit III.

Health care associated infections, Surgical site infections, Urinary tract infections, Ventilator associated pneumonia, Catheter associated blood stream infections, Antibiotic associated diarrhea.

Unit IV.
Drug resistant bacteria, MRSA, VRE, Drug resistant Gram negative bacteria

Occupationally acquired infections and its prevention, Respiratory route - Tuberculosis, Varicella zoster virus, Influenza, RSV, Blood borne route - HIV, HBV, HCV, CMV, Ebola, Orofecal route - Salmonella, Hepatitis A, Direct contact - Herpes virus

Practicals:
1. Sterilization and disinfection practices in tertiary care hospital
2. Quality control of sterilization and Interpretation of results of sterility testing
3. Collection of specimen from outpatient units, inpatient units, minor operation theatre and major operation theatre for sterility testing.

Recommended Books:

- Textbook of Microbiology by Ananthnarayan and paniker

- Textbook of hospital infection control by Purvamathur

- Textbook of Microbiology by Baveja

- Hospital infection control by Mayhall

Semester		Third (3rd)									
Course Code	Group	Course Type	Course Name / Title	Lord Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicable)	Internal	External		
BCCT303-21	Allied Health Sciences	Core Theory	General Pharmacology	3	1	0	0	40	60	100	4

Pre-requisite: -

Course Objectives :-

The Course aims to provides a learning and understanding safe and effective use of drugs for disease treatment in human being.

Course Outcomes :-

CO1- To study pharmacokinetics and pharmacodynamics of drugs used to treat various diseases and disorders.

CO2 – To understand the importance of drugs along with their safe and effective use for disease treatment in human being.

Unit I - General Pharmacology

a) Absorption, distribution, metabolism and elimination of drugs, routes of drug administration.

b) Basic principles of drug action.

c) Adverse reactions to drugs.

d) Factors modifying drug response.

Autonomic nervous system & Peripheral nervous system

a) Neurohumoral transmission

b) Sympathetic nervous system - sympathomimetics, sympatholytics

c) Parasympathetic - Cholinergics, Anticholinergics, Ganglion stimulants and blockers

d) Skeletal muscle relaxants

e) Local anaesthetics

Unit II - Central nervous system

a) General principles - neurotransmitters, definition and common transmitters

b) Drug therapy of various CNS disorders like epilepsy, depression, Parkinson's disease, schizophrenia, neuro- degeneration etc.

c) Pharmacotherapy of pain

d) General anaesthetics

e) Drugs for arthritis & gout

Autacoids

a) Histamine and antihistaminics

b) Prostaglandins, leukotrienes, thromboxane and PAF

c) Substance P, bradykinin

Unit III - Cardiovascular system

a) Drug therapy of hypertension, shock, angina, cardiac arrhythmias

b) Renin angiotensin system

c) Diuretics

d) Coagulants and anticoagulants, antiplatelet drugs

e) Hypo-lipidemics

Unit IV- Gastrointestinal and respiratory system

a) Emetics and antiemetics

b) Drugs for constipation and diarrhoea

c) Drug treatment of peptic ulcer

d) Drug therapy of bronchial asthma

e) Pharmacotherapy of cough

Hormones

a) Drug therapy of Diabetes

b) Thyroid hormones

c) Pituitary-hypothalamic axis

d) Corticosteroids

e) Oxytocin and drugs acting on uterus

f) Drugs affecting calcium balance

Chemotherapy

a) General principles of antimicrobial chemotherapy, rational use of antibiotics

b) Chemotherapeutic agents - b- Lactam Antibiotics, fluoroquinolones, macrolides, aminoglycoside, tetracyclines, chloramphericol and polypeptide antibiotics.

c) Chemotherapy of tuberculosis,

d) Cancer Chemotherapy

Miscellaneous

a) Immunomodulators

b) Drug therapy of glaucoma and cataract

c) Treatment of poisoning

PRACTICALS

A) Experimental exercise on pharmacy

a) General principles of pharmacy

b) Prescription writing exercises

c) Preparation and dispensing of powders, emulsions ointments, mixtures, liniments, suppositories and syrups

B) Spotting exercise - Identify the commonly used items in Pharmacology

C) Exercises on drug interactions

Semester		Third (3rd)									
Course Code	Group	Course Type	Course Name / Title	Lord Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicable)	Internal	External		
BCCT304-21	Allied Health Sciences	Core Theory	Electrocardiography (ECG)	3	1	0	0	40	60	100	4

Pre-requisite: -

Course Objectives :-

The Course aims to provides a learning in handling instruments and understand basic principal of ECG.

Course Outcomes :-

CO1 – To understand basic principal of ECG.

CO2 – To be able to recognize the normal PQRS waves and their significance in normal cardiac function.

CO3 – To achieve expertize in handling instruments used in critical cardiac care.

Unit I - Basic ECG

i) Basic principles of ECG - The Electrocardiographic paper

- The Electrocardiograph
- The Electrical field of Heart
- The leads.standard limb lead, Precardial lead, 'V' lead & ' AV' lead
- Basic ECG deflections.

ii) Normal ECG

- The 'P' wave
- The 'QRS' complex
- T wave, the S-T segment, P-R segment
- The 'U' wave
- Rate & rhythm
- Rotation of the heart, The Q-T interval.

Unit II

- iii) The Electrical axis
- iv) Precardial pattern of ECG
- v) Chamber enlargement-atrial enlargement, LV hypertrophy & RV hypertrophy

Unit III

- Echocardiography

* Basic principles of ultrasound

* M-Mode Echocardiography

* Two dimensional Echocardiography

* Doppler Echocardiography, colour flow

* Transoesophageal Echocardiography

Unit IV - Instrumentation:

* Basic pulse Echo system

* Transducers

* Pulse generation

* Echo detection

* Echo displays

* A mode, B mode, M-mode

* Display & recording

PRACTICALS / DEMONSTRATION:

• ECG spotters of all cardiac disease conditions

• Right atrial enlargement

• left atrial enlargement

• Right Axis deviation

- Left Axis deviation
- Hypertrophy
- Arrhythmias

a. Sinus rhythm, Sinus bradycardia and tachycardia

b. Ventricular tachycardia

c. Ventricular flutter

d. Ventricular fibrillation

- Pulse oximeter
- ABG

Semester		Third (3rd)									
Course Code	Group	Course Type	Course Name / Title	Lord Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicable)	Internal	External		
BCCT305-21	Allied Health Sciences	Core Theory	Life Style Diseases	3	1	0	0	40	60	100	4

Pre-requisite: -

Course Objectives :-

The Course aims to provides a learning and understanding cardiac diseases along with the diagnosis and treatment.

Course Outcomes :-

CO1 – To understand the prevalence causes and prevention of cardiovascular diseases and other lifestyle diseases.

CO2 – To understand signs and symptoms of cardiac diseases along with the diagnosis and treatment.

Unit I.

- Prevalence, causes and prevention of cardiovascular diseases : a) IHD b) RHD C) Hypertension d) CHD
- Heart failure: Causes, Types, symptoms and signs, diagnosis, management, prevention.
- Arrhythmias: Brady and Tachyarrhythmia's, causes, diagnosis and management.
- Atherosclerosis: Definition, risk factors, pathogenesis, Clinical significance and prevention.

Unit II.

- Coronary artery disease: Types, Causes, Symptoms and signs, diagnosis, investigations, management, complications.
- Hypertension: Definition, causes, signs and symptoms, diagnosis, evaluation, management.

Unit III.

- Pulmonary Hypertension: Definition, Causes, diagnosis and treatment.
- Rheumatic fever, Rheumatic Heart disease, Mitral valve and aortic valve disease. Infective endocarditis.
- Congenital Heart Diseases: Common CHD, Diagnosis and management ASD, VSD, PDA, PS, AS, Coarctation of aorta, Dextrocardia.

Unit IV.

- Cardiomyopathies: Dilated Cardiomyopathy, Hypertrophic Cardiomyopathy, Restrictive Cardiomyopathy
- Pericardial diseases: Acute Pericarditis, Pericardial effusion, Pericardialtamponade.
- Chronic constrictive pericarditis
- Peripheral vascular diseases
- Anaemia
- Acute and chronic renal failure
- Fluid therapy, Central venous lines. Interpretation of Investigation reports.

PRACTICALS:

Case Studies of life styles diseases

1. History Taking and clinical examination, monitoring of patient.
2. Therapeutic options for various diseases and conditions

Reference Books (latest edition)

1. Basic Pathology Robbins Saunders an imprint of Elsevier Inc., Philadelphia, USA

2. Text book of Pathology Harsh Mohan Jaypee Brothers, New Delhi

3. Practical Pathology P. Chakraborty, Gargi Chakraborty New Central Book Agency, Kolkata

4. Text Book of Haematology Dr. Tejinder Singh Arya Publications, Sirmour (H.P)

5. Text Book of Medical Laboratory Technology Praful Godkar, Bhalani Publication House, Mumbai

6. Text Book of Medical Laboratory Technology Ramanik Sood

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Semester		**Third (3rd)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BCCT311-21	Allied Health Sciences	Core Theory	Non-invasive Diagnosis Cardiovascular system	2	0	0	0	40	60	100	2

Pre-requisite: -

Course Objectives :-

The Course aims to provides a learning and understanding non-invasive diagnostic modalities used to detect coronary artery disease.

Course Outcomes :-

CO1 - To evaluate differences in downstream testing, coronary revascularisation, and clinical outcomes following non-invasive diagnostic modalities used to detect coronary artery disease.

CO2 - To understand the impact that narrowing's and blockages have on blood flow to your heart.

CO3 – To comprehend the steps of ECG interpretation including the properties of a normal sinus rhythm.

Unit I –
Noninvasive

- Technique of ECG recording
- ECG Leads system
- ECG waves - PQRSTU, Osborn wave, delta wave, epsilon wave.
- ECG rates, rhythm, axis calculation, lead positioning.
- Intervals and segments - PR interval, PR segment, ST segment, QT interval, J point and QRS complex.

Unit II

- ECG anatomy - Chambers enlargement.
- Technical artefacts
- ECG reportingExercise Testing to Diagnose Obstructive Coronary Artery Disease - Rationale and Guidelines, Pretest Probability (true positive, false positive, true negative and false negative ST-Segment Interpretation, Confounders of Stress ECG Interpretation.

Unit III –
Noninvasive Echocardiography -

- Introduction and purposes, demonstration of machine parts,
- Basic windows
- Echocardiographic views

Unit IV-

- Imaging modes - two-dimensional (2D) imaging, M-mode imaging, and Doppler imaging, color - flow mapping.

4th SEMESTER

Semester		Third (4th)									
Course Code	Group	Course Type	Course Name / Title	Lord Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicable)	Internal	External		
BCCT401-21	Allied Health Sciences	Core Theory	Basic Patient care	3	1	0	0	40	60	100	4

Pre-requisite: -

Course Objectives :-

The Course aims to provides a learning and understanding about asepsis, and the cleanliness related to asepsis and on mobility of the patients.

Course Outcomes :-

CO1 – To Measure Vital Signs, do basic physical examination of the patients, NG tube basics, Administration of Medicines.

CO2 - The students will learn about asepsis, and the cleanliness related to asepsis and on mobility of the patients.

CO3 - To understand the basic ideas on how to check for vital Signs of the patient.

Unit I

Introduction, Communication and Documentation - **Introduction to Patient Care:** Principles of patient care. Types of patients (gender, age, diseases, severity of illness, triage). **Communication & Documentation:** Communication with doctors, colleagues and other staffs. Non-verbal communication, Inter-personnel relationships. patient contact techniques, communication with patients and their relatives,
Documentation: Importance of documentation, initial and follow up notes; documentation of therapy, procedures and communication

Unit II

Universal Precautions and Infection Control - **Universal Precautions and Infection Control:** Hand washing and hygiene, Injuries and Personal protection, Insulation and safety procedures, Aseptic techniques, sterilization and disinfection, Disinfection and Sterilization of devices and equipment, Central sterilization and supply department, Biomedical Medical waste management

Unit III

Medication Administration and Transport of patient -**Medication Administration:** Oral/Parenteral route, Parenteral medication administration: Intra venous, intra muscular, sub-cutaneous, intra dermal routes, Intra venous Infusion, Aerosol medication administration, Oxygen therapy, Intravenous fluids, Blood and blood component transfusion.

Position and Transport of patient: Patient position, prone, lateral, dorsal, dorsal recumbent, Fowler's positions, comfort measures, bed making, rest and sleep. Lifting and transporting patients: lifting patients up in the bed, transferring from bed to wheel chair, transferring from bed to stretcher. Transport of ill patients (inotropes, intubated / ventilated patients)

Unit IV

Bedside care and monitoring-Bedside care: Methods of giving nourishment: feeding, tube feeding, drips, transfusion. Recording of pulse, blood pressure, respiration, saturation and temperature. Bed side management: giving and taking bed pan, urine container. Observation of stools, urine, sputum, drains. Use and care of catheters and rubber goods. Care of immobile/bed ridden patients, bed sore and aspiration prevention

Monitoring of Patient: Pulse, ECG (Cardiac Monitor), Oxygen Saturation, Blood Pressure, Respiration, Multi parameter monitors, Capnography and End Tidal CO2 (ETCO2),Hydration, intake and output monitoring Monitoring ventilator parameters: Respiratory Rate, Volumes, Pressures, Compliance, Resistance.

Dressing and wound care: Bandaging: basic turns, bandaging extremities, triangular bandages and their application. Surgical dressing: observation of dressing procedures. Suture materials and suturing techniques**,** Splinting**.** Basic care of patient with burns.

PRACTICALS

1. Demonstration of Patient care Procedures:

a) Positioning of patient, transport of the patient, Dressing and Bandaging, Care of inter costal drain tube, Insertion of naso-gastric tube and feeding
b) Phlebotomy and obtaining blood samples, Arterial Blood sampling for ABG
c) Injections: intra muscular, intra venous, sub cutaneous, intra dermal
d) Insertion of intra venous catheter and infusion of medications, blood transfusion
e) Recording of ECG and monitoring of patient
f) Oxygen therapy: oxygen cannula, masks. Aerosol therapy: nebulization, inhalers
g) Suctioning and care of artificial airway
h) Insertion of urinary bladder catheter
2. Uses, principles, advantages and disadvantages of instruments and Devices in patient care
3. First aid and Basic Life Support (BLS)

{Practical: Spotters, Drugs, Instruments and devices - identification and usage, demonstration of patient care procedures. }

Reference Books:

2. Principles and practice of Nursing - Sr Nancy

3. Introduction to Critical Care Nursing - Mary Lou Sole

4. First Aid - Redcross society guidelines

5. Basic Life Support (BLS) - American Heart Association guidelines

Semester		Third (4th)									
Course Code	Group	Course Type	Course Name / Title	Lord Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicable)	Internal	External		
BCCT402-21	Allied Health Sciences	Core Theory	Basics Cardiac Evaluation	3	1	0	0	40	60	100	4

Pre-requisite: -

Course Objectives :-

The Course aims to provides a learning and understanding about new techniques for procedures in and around the heart and various heart diseases.

Course Outcomes :-

CO1 - To enable students, understand new techniques for procedures in and around the heart and various heart diseases.

CO2 - To understand such interventions which include diagnostic and therapeutic electrophysiology; implantation or exchange of complex pacemaker

systems or percutaneous cardio-verter defibrillator-pacers; percutaneous valve repairs or replacements etc.

Unit I

Heart diseases and related disorders

- Ischaemic heart disease
- Rheumatic heart disease
- Congenital heart disease
- Arrhythmias
- Peripheral vascular disease
- Pericardial disease
- Shock state
- Cardiomyopathy
- Hypertension, diabetes, dyslipidaemias
- Infective endocarditis
- Heart failure
- Pulmonary hypertension and embolism

Unit II

Cardiovascular investigations: Noninvasive

- ECG - cardiac diagnosis by ECG: Chambers enlargement, arrhythmias, myocardial ischaemia and infarction.
- Echocardiography - cardiac diagnosis: valvular heart diseases, myocardial diseases, ischaemic heart diseases, Cardiomyopathies
- Pulmonary hypertension, infective endocarditis, intracardiac masses.
- Stress test- treadmill test review, pharmacological stress testing.
- 24 hours Holter monitoring
- Ambulatory BP monitoring
- Tilt table test
- Ankle-Brachial Index

Unit III

A. Cardiovascular pharmacological therapies

- Antiplatelets
- Anticoagulants
- Antiarrhythmic
- Antihypertensive
- Intravenous fluids
- Atropin
- Inotropics
- 2B 3A receptors blocking agents
- Diuretics
- Nitrates
- miscellaneous

B. Cardiovascular interventional therapies

- Coronary angioplasty
- Peripheral angioplasty
- Mitral valvoplasty
- Pulmonary and aortic valvuplasty
- Device closures
- Pacemakers
- Pericardiocentesis
- Myocardial biopsy
- Retrieval of foreign bodies
- Clot aspiration

Unit IV

Cardiovascular investigations: Invasive

- Diagnosis of coronary artery disease
- Diagnosis of valvular heart diseases in the cath-lab - stenosis, regurgitation and mixed
- Diagnosis of shunts
- Evaluation of pulmonary hypertension
- Diagnosis of pericardial constriction
- Diagnosis of peripheral and aortic diseases
- Complications of cardiac catheterization

PRACTICALS:

Non invasive Technology;

a) ECG recording basic

b) ECHO evaluation basic
c) Preparation for treadmill test
d) Preparation for 24 hours Holter monitoring
e) Preparation for ABPM

Invasive Technology;

a) Cardiac Cath right Heart
b) Cardiac Cath Left Heart
c) Cardiovascular Angiography
d) Cardiac Pacing
e) Relevant instrumentation in Cath Lab
f) Cardiac Emergencies in Cath Lab

Semester		Third (4th)									
Course Code	Group	Course Type	Course Name / Title	Lord Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicable)	Internal	External		
BCCT403-21	Allied Health Sciences	Core Theory	Cardiac Catheterization	3	1	0	0	40	60	100	4

Pre-requisite: -

Course Objectives :-

The Course aims to provides a learning and understanding Cardiac Catheterization.

Course Outcomes :-

CO1 - The students will gain knowledge about chances of a successful procedure.

CO2 - To enable students, understand about benefit/risk to the patient if the procedure is successful/ unsuccessful.

CO3 - The occurrence and management of various complications.

Unit I

- Preparation for Cath procedure and post procedure care.
- 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, guidewires, pacemakers, contrast materials & other materials used in the Cardiac Catheterization Laboratory and Sterlisation of all these materials.

Unit II

- Right heart Catheterization- procedure, cath position, Oxymetry at various levels, angios done & its interpretation.
- Left heart catheterization- procedure, cath position, Oxymetry at various levels, angios done & its interpretation.
- Coronary Angiogram-procedure, materials used, type & amount of dye used, indications & contra indications, various pictures recorded in various angles and gross interpretation.
- Peripheral Angiogram- procedure, indication & contra indication.
- Coronary Angioplasty- procedure, materials used, complications one may encounter and how to manage it.

Unit III

- Peripheral Angioplasty- materials used & procedure. Angioplasty of coarctation of aorta
- Valvuloplasties- procedure, indications, complications and preparation of balloons, mitral valvuloplasty, balloon aortic valvuloplasty, Balloon pulmonary valvuloplasty& Balloon tricuspid valvuloplasty,
- Coil closure & device closure of PDA- procedure , indications & materials used for coil & device closure of PDA
- Device Closure of ASD- procedure , indications & materials used for device closure of ASD
- Device Closure of VSD procedure , indications & materials used for & device closure of VSD

Unit IV

- Electrophysiological studies-basic knowledge of electrophysiological studies.
- Oxymetry – handling of the instruments & use fullness of the instruments, normal & abnormal values.
- Pressure recording- handling of the instrument & pressures in various chambers, normal & abnormal values.
- Temporary & permanent pacing- materials used, procedure, complications one may encounter & management.
- CD recording & storage- Recording & storage of all the procedures over CD.
- Procedure during pregnancy- precautions to be followed.

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- Nuclear cardiology- instrumentation, radiopharmaceuticals, patient imaging techniques

PRACTICAL -

a) Sterilization techniques
b) Hardwares used in Cardiac Catheterization
c) Procedures involved in Cardiac Catheterization

Semester		**Third (4th)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BCCT404-21	Allied Health Sciences	Core Theory	Cardiac Medical Instrumentation	3	1	0	0	40	60	100	4

Pre-requisite: -

Course Objectives :-

The Course aims to provides a learning and understanding about medical equipment.

Course Outcomes :-

CO1 – To introduce the student to the various sensing and measurement devices of electrical origin.

CO2 - To bring out the important and modern methods of imaging techniques.

CO3 - To provide awareness of electrical safety of medical equipment.

CO4 - To provide the latest ideas on devices of non-electrical devices.

CO5 - To provide latest knowledge of medical assistance / techniques and therapeutic equipment.

Unit I

- Cardiac Angiography
- Blood pressure recording
- Medical ultrasound and Doppler

Unit II

- Ionic currents and Electrocardiography
- ECG Machine
- Patient monitor
- Stress Test Machine

Unit III

- Central Monitoring System
- Sphygmomanometer
- Pulse Oximeter
- Stethoscope

Unit IV

- Defibrillators
- Pressure transducers
- Techniques of monitoring radiation exposure
- Computer use in medical care and data entry

PRACTICAL ASSESSMENT:

- Spotters

- Video Clips
- Demonstration of common disorders

Mapping of Course Outcomes with the Program Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

Study Scheme & Syllabus of

Bachelor of Cardiac Care Technology

(Semester V)

Batch 2021 Onwards

By

Board of Studies

I K GUJRAL PUNJAB TECHNICAL UNIVERSITY KAPURTHALA

SEMESTER- V

Semester		**Fifth (5th)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Load Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BCCT-501-21	Allied Health Sciences	Core Theory	Cardiac Catheterization laboratory Advanced	3	1	0	0	40	60	100	4
BCCT-502-21	Allied Health Sciences	Core Theory	Medicines relevant to cardiac care technology	3	1	0	0	40	60	100	4
BCCT-503-21	Allied Health Sciences	Core Theory	Applied Pathology	3	1		0	40	60	100	4
BCCT-504-21	Allied Health Sciences	Core Theory	Basics of Computer Applications	3	1	0	0	40	60	100	4
BCCT-505-21	Allied Health Sciences	Core Practical Lab	Applied Pathology (L)	0	0	4	0	60	40	100	2
BCCT-506-21	Allied Health Sciences	Core Practical Lab	Basics of Computer Applications (L)	0	0	2	0	60	40	100	2
BCCT-507-21	Allied Health Sciences	Core Practical Lab	Cardiac Catheterization laboratory Advanced	0	0	4	0	60	40	100	2
			Total	12	4	10		300	300	700	22

SEMESTER- V

Semester		Fifth (5th)									
Course Code	Group	Course Type	Course Name / Title	Lord Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicable)	Internal	External		
BCCT-501-21	Allied Health Sciences	Core Theory	Advanced Cardiac Catheterization laboratory	3	1	0	0	40	60	100	4

COURSE OBJECTIVES

To get familiar with advanced techniques used in cardiac catheterization laboratory.

COURSE DESCRIPTION

This course is at the forefront of cutting-edge cardiovascular diagnostic and interventional procedures, equipped with state-of-the-art technology and staffed by a team of highly skilled cardiologists, technologist and nurses, CCL provides advanced cardiac care that meets the evolving needs of patients.

COURSE OUTCOMES

CO1 Students will be able to identify and evaluate fundamental principles of aortic angiography, Balloon Mitral valvuloplasty.

CO2 Students will be able to identify and evaluate fundamental principles of coronary angioplasty.

CO3 Students will be able to identify and evaluate techniques and hardware used in BMV, setting up the laboratory for a BMV case technique and equipment used for trans-septal puncture.

CO4 Students will be able to identify and evaluate Thromboembolic disease, indications, and use of venacaval filters, techniques of thrombolysis.

CO5 Students will be able to identify and evaluate Catheters used in electrophysiology studies and use of catheter.

Unit-1 **10 Hours**

Introduction

Aortic angiography - aortic root, arch, abdominal aorta, Peripheral angiography and carbon dioxide angiography, Catheterization, and angiography in children with congenital heart disease, **Contrast agents:** Ionic and non-ionic, types of non-ionic agents, Contrast nephropathy, Measures to reduce incidence of contrast nephropathy.

Unit – 2 **10 Hours**

Coronary angioplasty (PTCA) - Equipment and hardware used in PTCA: Guiding catheters Guidewires, Balloons, Stents, Setting up the laboratory for a PTCA case Management of complications: Slow flow/no flow, acute stent thrombosis, Dissection, Perforation

Unit – 3 **15 Hours**

Balloon Mitral valvuloplasty (BMV) - Techniques and hardware used in BMV, Setting up the laboratory for a BMV case Technique and equipment used for trans-septal puncture, Recording of transmitral pressure gradients, Management of cardiac tamponade, Peripheral interventions, Equipment and techniques used, Endovascular exclusion of aneurysms Self expanding stents, covered stents and cutting balloons, Intra-aortic balloon pump (IABP) Theory of intra -aortic balloon counter pulsation, Indications for IABP use, setting up the IABP system

Unit – 4 **10 Hours**

Thromboembolic disease - Indications and use of venacava filters, Techniques of thrombolysis – drug and catheters used, Thrombus aspirations systems – coronary, peripheral, Cardiac pacing, Temporary pacing – indications, technique, Permanent pacing, Indications, Types of pacemakers and leads, setting up the laboratory for permanent pacing, Pacemaker parameter checking, Follow-up of pacemaker patients.

Suggested Books

1. Donald S. Baim Grossman's Cardiac Catheterization, Angiography, and Intervention, Volume 1 Lippincott Williams & Wilkins, 2005.

2. Morton L. Kern, Morton J. Kern The Cardiac Catheterization Handbook Elsevier Health Sciences, 2011.

Semester		Fifth (5th)									
Course Code	Group	Course Type	Course Name / Title	Load Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicable)	Internal	External		
BCCT-502-21	Allied Health Sciences	Core Theory	Medicines relevant to cardiac care technology	3	1	0	0	40	60	100	4

COURSE OBJECTIVE

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 effect, drug interaction, knowledge of chemical and trade names, importance of manufacture and expiry dates and instructions about handling each drug.

COURSE OUTCOMES

CO 1 Know the importance of cardiovascular drugs including antihypertensives etc.

CO 2 Gain knowledge about antianginal and anti-failure agents.

CO 3 Provide students insight into angiotensin converting enzyme (ACE) inhibitors.

UNIT-1 **08 Hours**

Anti-anginal agents

1. Beta blockers
   Propranolol, Atenolol, Metoprolol, Bisoprolol carvedilol, esmolol.
2. Nitrates
   Nitroglycerine, Isosorbide dinitrate, Isosorbide mononitrate, Transdermal nitrate patches
3. Calcium channel blockers
   Nifedipine, Verapamil, Diltiazem, Amlodipine.

UNIT-2 **10 Hours**

Congestive Heart Failure

1. Diuretics-
   furosemide, toresamide, thiazide diuretics, metolazone, spironolactone, combination diuretics.
2. Angiotensin converting enzyme (ACE) inhibitors – captopril, Enalapril, Ramipril, lisinopril ACE inhibitors for diabetics and hypertensive renal disease.
3. Digitalis and acute ionotropic– digoxin, dobutamine, dopamine, adrenaline, noradrenaline, isoprenaline.

UNIT-3 **10 Hours**

Anti-hypertensive drugs

Brief introduction of drugs used in hypertension.

UNIT-4 **10 Hours**

Anti- arrhythmic agents

Amiodarone, adenosine, verapamil, diltiazem, lidocaine, mexiletine, Phenytoin, flecainide, beryllium, atropine

UNIT-5 **07 Hours**

Antithrombotic agents

Platelet inhibitors: aspirin, clopidogrel; Anticoagulants: heparin, low molecular weight heparin, warfarin; Fibrinolytics: streptokinase, urokinase; Glycoprotein 2b3a antagonists: abciximab, tirofiban, eptifibatide.

Suggested Books

1. “Antianginal Drugs: Pathophysiological, Haemodynamic, Methodological, Pharmacological, Biochemical” by Robert Charlier

2. “Pharmacological Basis of Therapeutics” by Goodman and Goodman.

Semester		**Fifth (5th)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicabl**	**Internal**	**External**		
BCCT-503-21	Allied Health Sciences	Core Theory	Applied Pathology	3	1	0	0	40	60	100	4

COURSE OBJECTIVE

This course will cover common cardiovascular diseases, their related pathology outline of clinical presentation and management of these conditions including medical and surgical interventions and to learn about all aspects of the organisms to not only determine how they live in their environment, but also how they impact their respective surroundings and thus other organisms around them (human beings, animals, etc.)

COURSE DESCRIPTION

The knowledge and understanding of Pathology of diseases is essential to institute appropriate treatment or suggest preventive measures to the patient. Microbiology involves the study of common organisms causing diseases including nosocomial infections and precautionary measures to protect one from acquiring infections. The knowledge and understanding of Microbiology & Pathology of diseases is essential for patient care.

COURSE OUTCOMES

CO1 To have a brief understanding of pathology of pericardial diseases

CO2 To learn about the electrical activities of the heart and their disturbance

CO3 To have a brief knowledge on the different types of hypertensions and its corrective treatment.

CO4 To learn about the myocardial diseases including heart failures and cardiomyopathies and their corrective treatment protocol.

Unit – 1 **12 Hours**

- Atherosclerosis-definition, risk factors, pathogenesis, morphology, and complications
- Ischemic heart disease: Myocardial infarction - definition, pathogenesis, morphology, and complications
- Hypertension- Benign and malignant hypertension: pathogenesis, pathology and complication appropriate treatment or suggest preventive measures to the patient.

Unit – 2 **13 Hours**

- Heart failure - Right and left heart failure: causes, pathophysiology, and morphology
- Rheumatic heart disease and infectious endocarditis - definition, etiopathogenesis, morphology and complications
- Congenital heart disease- Types and atrial septal defect; aneurysms - types and morphology; cardiomyopathies in brief

Unit -3 **10 Hours**

- Pneumoconiosis - types, asbestosis, coal workers pneumoconiosis - etiopathogenesis and morphology
- Pulmonary embolism, infarction, pulmonary hypertension - Definition, etiopathogenesis and morphology
- Pneumonia - Classification of pneumonias; Lobar pneumonia and bronchopneumonia - etiology, pathology, and complications

Unit – 4 **10 Hours**

- Clinical manifestations of renal diseases in relation to cardiac impairements.
- Glomerular lesions in systemic diseases - diabetes, amyloidosis, and systemic lupus erythematosus
- Pericardial and pleural effusions - causes and microscopy.

Suggested Books

1. Textbook of Medical Praful GodkarBhalani Publication House, LaboratoryTechnology
2. Practical Hematology Sir John Dacie.

3. Todd & Sanford, Clinical John Bernard Henry All India Traveler Bookseller, Diagnosis & Management Delhi by Laboratory Methods.
4. Basic Pathology Robbins Saunders an imprint of Elsevier Inc., Philadelphia, USA
5. Textbook of Pathology Harsh Mohan Jaypee Brothers, New Delhi
6. Practical Pathology P. Chakraborty, GargiChakraborty New Central Book Agency, Kolkata
7. Textbook of Hematology Dr.Tejinder Singh Arya Publications, Sirmour (H.P)
8. Textbook of Medical Laboratory Technology PrafulGodkar, Bhalani Publication House, Mumbai

Semester		Fifth (5th)									
Course Code	Group	Course Type	Course Name / Title	Lord Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicabl	Internal	External		
BCCT-504-21	Allied Health Sciences	Core Theory	Basics of Computer Applications (T)	3	1	0	0	40	60	100	4

COURSE OBJECTIVE

The students should be able to have a working knowledge of computer software and hardware and be able to use computers for enhancing their class work.

COURSE DESCRIPTION

This course involves an introduction to the use of computers in daily life. The students will be able to appreciate the role of computer technology. The course has focus on computer organization, computer operating system and software, and MS windows, Word processing, Excel data worksheet and PowerPoint presentation.

COURSE OUTCOMES

CO1 Students will be able to demonstrate the characteristics of computer, block diagram of computer, generations of computer, computer languages. (Unit-1)

CO2 Ability to identify and demonstrate the Input devices and output devices. Students will have the knowledge of The Central Processing Unit (CPU), main memory. They will be able to develop the sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices. (Unit-2)

CO3 Students will be able to operate the windows. They will be able to use MS-word. MS office: MS word, MS PowerPoint, MS Excel, install different software and data entry efficiency. (Unit-3)

UNIT 1 **10 Hours**

Introduction to Computers: Definition of Computer; Components of Computer; Characteristics of Computers; History evolution of Computers; Generation of computers; Classification of ComputersAccording to Purpose, According to Technology, According to Size and Storage Capacity; Human being VS Computer; Difference between Computer and Calculator.

UNIT 2 **15 Hours**

Input Devices: Mouse, Keyboard, Light pen, Track Ball, Joystick, MICR, Optical Mark reader and Optical Character reader. Scanners, Voice system, Web, Camera. Output Devices: Hard Copy Output Devices; Line Printers, Character Printers, Chain Printers, Dot-matrix Printers, Daisy Wheel Printer, Laser Printers, Ink jet Printers, Plotters, Soft Copy Device-Monitor, Sound card and speakers. Memory and Mass Storage Devices; Characteristics of Memory Systems; Memory Hierarchy; Types of Primary Memory; RAM and ROM; Secondary and Back-up; Magnetic Disks, Characteristics and classification of Magnetic Disk, Optical Disk, Magnetic Tape.

UNIT3 **10 Hours**

Documentation Using MS-Word -Introduction to Office Automation, Creating & Editing Document, Formatting Document, Auto -text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, Bookmark, Advance Features of MS-Word-Mail Merge, Macros, Tables, File Management, Printing, Styles, linking and embedding object, Template.

UNIT 4 **10 Hours**

Electronic Spread Sheet using MS-Excel -Introduction to MS-Excel, Creating & Editing Worksheet, Formatting and Essential Operations, Formulas and Functions, Charts, Advance features of MS-Excel-Pivot table & Pivot Chart, Linking and Consolidation.

Suggested Books

1. Sinha, P.K. & Sinha, Priti, Computer Fundamentals, BPB
2. Dromey, R.G., How to Solve it By Computer, PHI
3. Balagurusamy E, Computing Fundamentals and C Programming, Tata McGraw Hill
4. Norton, Peter, Introduction to Computer, McGraw-Hill
5. Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World
6. Rajaraman, V., Fundamentals of Computers, PHI
7. Ram, B., Computer Fundamentals, Architecture & Organization, New Age International (P) Ltd.

Semester		Fifth (5th)									
Course Code	Group	Course Type	Course Name / Title	Load Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicable)	Internal	External		
BCCT-505-21	Allied Health Sciences	Core Practical Lab	Applied Pathology (L)	0	0	4	0	60	40	100	2

Practical

Description & diagnosis of the following gross specimens.

- Atherosclerosis.
- Aortic aneurysm.
- Myocardial infraction.
- Emphysema
- Chronic glomerulonephritis.
- Chronic pyelonephritis.
- Pulmonary embolism.
- Pericardial and pleural effusions.

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Suggested Books

1. Textbook of Medical Praful GodkarBhalani Publication House, Laboratory Technology

   Practical Hematology Sir John Dacie.

2. Todd & Sanford, Clinical John Bernard Henry All India Traveler Book seller, Diagnosis & Management Delhi by Laboratory Methods.
3. Basic Pathology Robbins Saunders an imprint of Elsevier Inc., Philadelphia, USA
4. Textbook of Pathology Harsh Mohan Jaypee Brothers, New Delhi
5. Practical Pathology P. Chakraborty, GargiChakraborty New Central Book Agency, Kolkata

6. Textbook of Hematology Dr.Tejinder Singh Arya Publications, Sirmour (H.P)
7. Textbook of Medical Laboratory Technology PrafulGodkar, Bhalani Publication House, Mumbai

Semester		Fifth (5th)									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio (If Applicable)**	**Internal**	**External**		
BCCT-506-21	Allied Health Sciences	Core Practical Lab	Basics of Computer Applications (L)	0	0	2	0	60	40	100	2

Practical

1. Starting MS WORD, Creating and formatting a document, changing fonts and point size, Table Creation, and operations, Autocorrect, Auto text, spell Check, Word Art, inserting objects, Page setup, Page Preview, Printing a document, Mail Merge.

2. Starting Excel, Work sheet, cell inserting Data into Rows/ Columns, Alignment, Text wrapping, Sorting data, Auto Sum, Use of functions, referencing formula cells in other formulae, naming cells, generating graphs, Worksheet data and charts with WORD, Creating Hyperlink to a WORD document, Page set up, Print Preview, Printing Worksheets.

3. Preparing interactive Power point presentation, Working with Multimedia, Incorporating SmartArt and Charts, Insert charts to present data in a clear and visually appealing manner, Customizing Slide Master, Modify the Slide Master to create a consistent design throughout your presentation, Customize fonts, colours, backgrounds, and placeholders to match your desired style, Collaborating and Sharing, Explore the collaboration features of PowerPoint, such as co-authoring with others in real-time or leaving comments on specific slides.

4. Basic SPSS or GraphPad Prism for analyzing research data and performing statistical calculations, data analysis, generate graphs and charts, and interpret results.

Suggested Books

1. Sinha, P.K. & Sinha, Priti, Computer Fundamentals, BPB
2. Dromey, R.G., How to Solve it By Computer, PHI
3. Balagurusamy E, Computing Fundamentals and C Programming, Tata McGraw Hill

4. Norton, Peter, Introduction to Computer, McGraw-Hill
5. Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World
6. Rajaraman, V., Fundamentals of Computers, PHI
7. Ram, B., Computer Fundamentals, Architecture & Organization, New Age International (P) Ltd.

Semester		Fifth (5th)									
Course Code	Group	Course Type	Course Name / Title	Lord Allocation				Marks Distribution		Total Marks	Credit
				Lecture	Tutorial	Practical	Studio (If Applicable)	Internal	External		
BCCT-507-21	Allied Health Sciences	Core Practical Lab	Cardiac Catheterization laboratory Advanced	0	0	4	0	60	40	100	2

Practical

- Introduction Identify and evaluate the techniques used for cardiac catheterization.
- Identify and evaluate the techniques used for angiography.
- Identify and evaluate the techniques used for cardiac intervention.

Suggested Books

1. Donald S. Baim Grossman's Cardiac Catheterization, Angiography, and Intervention, Volume 1 Lippincott Williams & Wilkins, 2005.

2. Morton L. Kern, Morton J. Kern The Cardiac Catheterization Handbook Elsevier Health Sciences, 2011.

B.Sc. Medical Technology
(Cardiac Care Technology)

(Semester VI)

Batch 2021 Onwards

By

Board of Studies

I K GUJRAL PUNJAB TECHNICAL UNIVERSITY
KAPURTHALA

Semester		**Sixth (6th)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio**	**Internal**	**External**		
BCCT-601-21	Allied Health Sciences	Core Theory	Advanced ECG(electrocardiogram)	3	1	0	0	40	60	100	4
BCCT - 602-21	Allied Health Sciences	Core Theory	Advanced Echocardiogram	3	1	0	0	40	60	100	4
BCCT - 603-21	Allied Health Sciences	Core Theory	Advanced Cardiac Care Technology	3	1	0	0	40	60	100	4
BCCT - 604-21	Allied Health Sciences	Core Theory	Research & Biostatistics	3	1	0	0	40	60	100	4
BCCT - 605-21	Allied Health Sciences	Core Practical Lab	Advanced ECG(electrocardiogram)(L)	0	0	4	0	60	40	100	2
BCCT - 606-21	Allied Health Sciences	Core Practical Lab	Advanced Echocardiogram(L)	0	0	4	0	60	40	100	2
BCCT - 607-21	Allied Health Sciences	Core Practical Lab	Advanced Cardiac Care Technology (L)	0	0	4	0	60	40	100	2

Semester		**Sixth (6th)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio**	**Internal**	**External**		
BCCT 601-21	Allied Health Sciences	Core Theory	Advanced ECG (Electrocardiogram)	3	1	0	0	40	60	100	4

COURSE CODE - BCCT **-601-21**

COURSE NAME - ADVANCED ECG (Electrocardiogram)

COURSE OBJECTIVES

Upon successful completion of this course, students will be able to: Describe the anatomy and electrophysiology of the heart. Set up and administer ECG, stress tests and monitors. Recognize and correct artifacts.

COURSE DESCRIPTION

This advanced course in Electrocardiography (ECG) Interpretation is designed for healthcare professionals seeking an in-depth understanding of complex cardiac rhythms and ECG patterns. Participants will delve into advanced concepts, building

on their foundational ECG knowledge to enhance diagnostic skills and critical thinking in the real of cardiovascular health.

COURSE CONTENTS

Unit – 1 **10 HOURS**

The abnormal electrocardiogram
Left atrial abnormality
Right atrial abnormality
Left ventricular hypertrophy and enlargement
Right ventricular hypertrophy and enlargement

Unit – 2 **10 HOURS**

Intraventricular conduction delays
Left anterior fascicular block
Left posterior fascicular block
Left bundle branch block
Right bundle branch block

Unit – 3 **10 HOURS**

Mobitz type 1 and 2 block
Complete heart block
Direct Current (DC) shock
Monophasic and biphasic shock
Technique of cardioversion
Indications for cardioversion

Unit – 4 **12 HOURS**

Non-infarction Q waves

Primary and seconday T wave change

Electrolyte and metabolic ECG abnormalities

Cardiac arrhythmias

Ventricular premature beats

Supra-ventricular tachycardias

Atrial flutter/fibrillation

Ventricular Tachycardia/Ventricular fibrillation

Atrio Ventricular block

Prolonged PR interval

COURSE LEARNING OUTCOMES

CO1-Describe clinical significance of electrical deflections on ECG Review, six systemic approach to interpretation of 12 Lead ECG, components of a normal 12 Lead ECG. (Unit 1)

CO2- ECG changes in relation to physiological events. (Unit-2)

CO3- Analyze QRS axis shifts in relation to various disease states. (Unit-3)

CO4- Evaluate ECG patterns for presence of myocardial ischemia, injury and infarction. (Unit-4)

TEXT BOOKS

1. Antoni Bayes De Luna, A textbook of Clinical Electrocardiography, 4th edition 2010.

2. Tomas B. Gracia, MD, A textbook of 12 Lead ECG Interpretation, 2nd Edition 2008.

3. Coues, Electrocardiography in Clinical Practice, 6th Edition 2005.

Semester		**Sixth (6th)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio**	**Internal**	**External**		
BCCT602-21	Allied Health Sciences	Core Theory	Advanced Echocardiography	3	1	0	0	40	60	100	4

COURSE CODE - BCCT **-602-21**

COURSE NAME – ADVANCED ECHOCARDIOGRPHY

COURSE OBJECTIVES

To understand Echocardiography, Doppler Echocardiography, Contrast Echo and Echo measurements and its application in clinical practice.

COURSE DESCRIPTION

This comprehensive course provides an in-depth exploration of echocardiography, a crucial diagnostic tool in cardiovascular medicine. Echocardiography utilizes ultrasound technology to create real-time images of the heart, allowing healthcare professionals to assess cardiac structure, function, and hemodynamics. Participants will gain a solid foundation in the principles, techniques, and applications of echocardiography through a combination of theoretical knowledge and practical hands-on experience.

COURSE CONTENT

Unit – 1 **12 HOURS**

Echo in rheumatic heart disease- Echo in mitral stenosis, mitral incompetence, aortic stenosis, aortic incompetence, pulmonary hypertension, post MVR, Post AVR.

Echo in congenital heart disease- Echo in ASD, VSD, PDA, pulmonary stenosis, aortic stenosis, coarctation of aorta, TOF, Dextrocardia.

Unit – 2 **10 HOURS**

Echo in ischemic heart disease-

Echo in acute myocardial infarction, old myocardial infarction & other ischemic heart disease related conditions.

Echo in other cardiovascular disease-

Echo in various types of Cardiomyopathy, infective endocarditis, diseases of aorta.

Trans esophageal echocardiogram-

Indications, procedures, usefulness & complications, one may encounter and its management

Unit – 3 **08 HOURS**

Stress Echo-

Procedure & indications, Fetal echocardiogram- procedure, basic interpretation.

Peripheral Doppler- procedure & usefulness of Peripheral Doppler.

Assessment of cardiac function measurements of all cardiac chambers.

Unit - 4 **11 HOURS**

Contrast Echo cardiogram-

Procedure & usefulness of Contrast Echo cardiogram.

Myocardial Contrast Echo- Basic knowledge

Echo in pericardial disease-Pericardial effusion, Cardiac tamponade, constrictive pericarditis.

COURSE LEARNING OUTCOMES

CO1-To develop a thorough comprehension of the etiology, pathophysiology, and clinical manifestations of various diseases across different organ systems. (Unit-1)

CO2-To develop the ability to perform both transthoracic and transesophageal echocardiograms. (Unit-2)

CO3-Apply stress echocardiography techniques and understand the principles. (Unit-3)

CO4-To understand how to prepare the patient for a contrast echo. (Unit-4)

TEXT BOOK

1. Textbook of Echocardiography, by V Amuthan, Satish K Parashar.
2. Dr. Catherine Otto's Textbook of Clinical Echocardiography, 7th Edition
3. Practical Handbook of Echocardiography: 101 case studies by Wei - Hsian Yin and Brent M Egeland.
4. Text Book of Clinical Echocardiography by Catherine Motto

Semester		**Sixth (6th)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio**	**Internal**	**External**		
BCCT 603-21	Allied Health Sciences	Core Theory	Advanced Cardiac Care Technology	3	1	0	0	40	60	100	4

COURSE CODE - BCCT **-603-21**

COURSE NAME – ADVANCED CARDIAC CARE TECHNOLOGY

COURSE OBJECTIVES

To understand interventional cardiology, concepts, equipment's and procedures and its application in clinical practice.

COURSE DESCRIPTION

Course will also focus on providing care to patients in ICU, CCU or Cardiac Catheterization Lab; executing needs assessment, organizing patients for medical procedures, monitoring patient's vital signs, operating treatment equipment's, administering Intravenous therapy (IV)" and various tasks to be performed in the Cath-lab for interventional cardiac procedures. As this field is continuously evolving it is essential to keep updated on the latest technologies.

COURSE CONTENTS

UNIT – 1 **12 Hours**

Cardiac Diagnostic Modalities and Diagnosis Interpretation Diagnostic

Cardiac Diagnostic Modalities and Diagnosis Interpretation Diagnostic

Interpretation of TMT reportt

Criteria for TMT positive test

Contraindication for TMT conditions where TMT is not useful

Complications of TMT room and its management

UNIT – 2 **11 Hours**

Pediatric Interventions

Aortic and pulmonary valvuloplasty

Coarctation angioplasty and stenting

Device closure of PDA, ASD, VSD

Technique and devices used Sizing of devices & Coil

UNIT – 3 **08 Hours**

Acquisition of Cath Data: Cardiac Output / Oximetry and Shunts

Acquisition of Cath Data: Pressures and Wave Forms; Recording Technique Analysis

Angiography: Technique / Views / Contrast Media

UNIT – 4 **11 Hours**

Sterile Techniques in Cath Lab / Sterile Areas, Sterile Procedure, sterile trolley setting, Scrubbing, gowns and Gloves, scrubbing and draping Patients, handling sterile disposablesetc.

Sterilization and re-use of hardware

Radiation safety in the cath lab: Basic principles and practices:

Discuss basic principles and practices for ensuring radiation safety in the cardiac catheterization laboratory.

COURSE LEARNING OUTCOMES

CO1-To develop an understanding regarding treadmill test.(Unit-1)

CO2- Understand the characteristics of different closure devices and coils, including their composition, deployment mechanisms, and potential complications (Unit-2)

CO3- Identify the key locations for pressure measurements during catheterization.(Unit-3)

CO4-Understand and follow established guidelines and protocols related to sterile techniques in the Cath Lab, ensuring compliance with regulatory standards.(Unit-4)

TEXT BOOK

1. Text book the Interventional Cardiac Catheterization Handbook, 5thEdition.
2. KERN'S Cardiac catheterization handbook: 7TH edition.
3. A Textbook of Coronary, Peripheral, and Structural Heart Disease, 2nd Edition.
4. Cardiac Catheterization in Congenital Heart Disease: Pediatric and Adult

Semester		**Sixth (6th)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio**	**Internal**	**External**		
BCCT 604-21	Allied Health Sciences	Core Theory	Research & Biostatistics	3	1	0	0	40	60	100	4

COURSE CODE - BCCT **-604-21**

COURSE NAME – RESEARCH & BIOSTATISTICS

COURSE OBJECTIVES:

The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings.

COURSE DESCRIPTION:

This course involves a description of principles for conducting research.

COURSE CONTENT

UNIT I **8 Hours**

Introduction to research methods,

Identifying research problem,

Ethical issues in research

Research design

UNIT 2

12Hours

Basic Concepts of Biostatistics,

Types of Data,

Research tools and Data collection methods, sampling methods,

Developing a research proposal

UNIT 3 **10 Hours**

Elementary Statistics: The mean, median, mode, standard deviation, variance, covariance of data.

Representation of data- discrete data, continuous data, histogram, polygons, frequency curves. Mean, Median, Quartiles, Percentile, Skewness, Standard deviation, Variance, Scatter diagrams.

Introduction to statistical sampling from a population, Random Sampling.

UNIT 4 **8 Hours**

Hypothesis Testing: Concept of Null and Alternate Hypothesis.

Chi-square test (Goodness of fit and association of attributes).

Fischer test.

Student t-test.

One way ANOVA

Text Book

1. Mahajan BK : methods in biostatistics for medical students & research workers, 6th edition Jaypee, 1997

2. Kothari CR : Research methodology- Methods & technique, Wiley eastern LTD

COURSE LEARNING OUTCOMES:

CO 1- Understanding Biostatistics & Methodology of Research

CO 2- Assessing and designing of research

CO 3- Analyzing the clinical audit and data

CO 4- Understanding concept of hypothesis & testing(Unit-4)

Semester		**Sixth (6th)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio**	**Internal**	**External**		
BCCT 605-21	Allied Health Sciences	Core Practical/Lab	Advanced Electrocardiogram(L)		0	4	0	40	60	100	2

Practicals

1. Interpretation of Normal ECG and Basic abnormalities of ECG 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, inferior wall, true posterior wall and sub endocardial infarction and RV infarction.
2. 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
3. ECG in hypertension- definition of hypertension, how to record blood pressure, ECG in hypertension

4. 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 condition

Semester		**Sixth (6th)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio**	**Internal**	**External**		
BCCT**606-21**	**Allied Health Sciences**	**Core Practical/Lab**	**Advanced Echocardiogram(L)**		**0**	**4**	**0**	**40**	**60**	**100**	**2**

PRACTICALS

1. Patient Preparation
   a. Explain the procedure - inform the patient about what to expect during the echocardiography.
2. Positioning
   a. Ask the patient to lie on their left side.
3. Image Acquisition
   a. Transthoracic echocardiography - Take standard heart views (parasternal, Apical, subcostal).
4. Documentation & Reporting
5. Image storage - save important images and video clips.
6. Generate Report - Summarize finding in a comprehensive report.

Semester		**Sixth (6th)**									
Course Code	**Group**	**Course Type**	**Course Name / Title**	**Lord Allocation**				**Marks Distribution**		**Total Marks**	**Credit**
				Lecture	**Tutorial**	**Practical**	**Studio**	**Internal**	**External**		
BCCT 607-21	Allied Health Sciences	Core Practical/Lab	Advanced Cardiac Care Technology (L)	0	0	4	0	40	60	100	2

Practicals

1. Identification of the various instruments used in a cath study / BMV / PTCA
2. Packing and washing of all equipment's in a cardiac catheterization lab.
3. Angiography views.
4. Post-Catheterization Care.

B.Sc. Cardiac Care Technology

[Semester VII-VIII]

7th Semester

Course Code	Course Title	Marks Distribution			Credits
		Internal	External	Total	
BCCT-701-21	Semester Internship	200	-	200	8

8th Semester

Course Code	Course Title	Marks Distribution			Credits
		Internal	External	Total	
BCCT-801-21	Semester Internship	200	-	200	8

Annexure-I

GUIDELINES FOR INTERNSHIP TRAINING PROGRAMME

For

Final year B.Sc. (Cardiac Care Technology)

1. INTRODUCTION:

Internship is a phase of training where a graduate student of Cardiac Care Technology gains practical clinical experience under supervision. During this period, the intern works in different cardiac departments and develops skills required for patient monitoring, diagnostic procedures, and assistance in cardiac interventions.

2. PROCEEDING OF INTERNSHIP:

The compulsory internship will include rotational clinical postings and skill development over a period of one year. Students will follow the rules and regulations related to attendance, performance, and evaluation during the internship.

3. OBJECTIVES:

At the end of internship, the student should be able to:

1. Monitor cardiac patients using ECG and bedside monitors.
2. Assist cardiologists in invasive and non-invasive cardiac procedures.
3. Record and perform diagnostic tests such as ECG, TMT, Holter monitoring, and Echocardiography.
4. Identify and assist in management of cardiac emergencies.
5. Handle cardiac care equipment such as defibrillator, monitors, and ventilators.
6. Maintain patient records and clinical documentation.
7. Follow infection control and hospital safety protocols.
8. Assist in post-operative cardiac patient care.
9. Work effectively as a member of the cardiac healthcare team.
10. Develop communication skills with patients and healthcare staff.

4. **INTERNSHIP** – minimum 1440 hours in not less than 180 days evenly spread over TWO Semesters.

The student will have to submit Attendance certificate issued by the Authorized person/ Head of the Hospital/Department where the student is undergoing internship at the end of each semester. (Form-1)

Students have to undertake the rotational postings during which students have to work under supervision of an experienced staff in the following areas:

Postings Duration

S. No.	Posting Area	Duration
1	Cardiac ICU (CCU/ICCU)	2 Months
2	Emergency / Casualty	1 Month
3	Cardiac Catheterization Lab	2 Months
4	Non-Invasive Cardiology Lab	1 Month
5	Echocardiography Lab	1 Month
6	Cardiac Operation Theatre	1 Month
7	Post-Operative Cardiac ICU	1 Month
8	Cardiology Ward	1 Month
9	Electrophysiology Lab	1 Month
10	Elective/Revision	1 Month

5. **COMPETENCIES TO BE ACQUIRED DURING INTERNSHIP**

Students must be able to assist independently the following procedures at the end of their postings

5.1 Cardiac ICU (CCU / ICCU)

5.1.1 ECG monitoring of critically ill cardiac patients.
5.1.2 Monitoring vital parameters such as Heart Rate (HR), Blood Pressure (BP), SpO_2 and Central Venous Pressure (CVP).
5.1.3 Basic ventilator monitoring and patient observation.
5.1.4 Use of defibrillator during cardiac emergencies.
5.1.5 Assistance in cardiopulmonary resuscitation (CPR – BLS & ACLS exposure).
5.1.6 Knowledge of emergency cardiac drugs used in ICU.

5.2 Emergency / Casualty Department

5.2.1 Assessment and triage of patients with chest pain.
5.2.2 Recording ECG in emergency situations.
5.2.3 Identification of myocardial infarction cases such as STEMI and NSTEMI.
5.2.4 Participation in emergency resuscitation procedures.
5.2.5 Crash cart preparation and management.

5.3 Cardiac Catheterization Laboratory (Cath Lab)

5.3.1 Assistance in coronary angiography procedures.
5.3.2 Assistance in Percutaneous Transluminal Coronary Angioplasty (PTCA).
5.3.3 Knowledge of different types of stents and cath lab instruments.
5.3.4 Maintenance of sterile techniques during procedures.
5.3.5 Radiation protection and safety practices in cath lab.

5.4 Non-Invasive Cardiology Laboratory

5.4.1 Recording of 12-Lead Electrocardiogram (ECG).
5.4.2 Treadmill Test (TMT) procedure and monitoring.
5.4.3 Holter monitoring and patient preparation.
5.4.4 Ambulatory Blood Pressure Monitoring (ABPM).

5.5 Echocardiography (ECHO Lab)

5.5.1 Basic principles of 2D Echocardiography.
5.5.2 Doppler Echocardiography basics.
5.5.3 Patient positioning for echocardiography.
5.5.4 Handling and care of echocardiography probe and equipment.

5.6 Cardiac Operation Theatre

5.6.1 Observation of Coronary Artery Bypass Graft (CABG) surgery.
5.6.2 Observation of valve replacement surgeries.
5.6.3 Basic understanding of heart-lung machine.
5.6.4 Operation theatre sterile protocols and patient preparation.

5.7 Post-Operative Cardiac ICU

5.7.1 Hemodynamic monitoring of post-operative patients.
5.7.2 Drain and line management.
5.7.3 Ventilator monitoring in post-surgical patients.
5.7.4 Infection control practices in ICU.

5.8 Cardiology Ward

5.8.1 Routine ECG recording.
5.8.2 Monitoring medication administration.
5.8.3 Basic patient counselling.
5.8.4 Understanding discharge summary and patient records.

5.9 Electrophysiology (EP Lab)

5.9.1 Assistance in pacemaker implantation procedures.
5.9.2 Basic knowledge of Implantable Cardioverter Defibrillator (ICD).
5.9.3 Basic knowledge of Cardiac Resynchronization Therapy (CRT).
5.9.4 Observation of Electrophysiology Study (EPS).

6. EXIT VIVA

There will be one exit Viva to be conducted at End of training and student has to score SATISFACTORY grade.

7. EVALUATION

❖ During the rotational posting, students shall assist in cardiac diagnostic procedures, patient monitoring and also undertake skills of maintaining administrative records and maintenance of equipment.

❖ The candidate shall maintain a log book (Form-2) & record all the events of the respective posting. He /She shall be closely monitored by the senior staff in charge throughout the posting & the same shall also sign in the Log book on completion of the assignment.

8. START OF INTERNSHIP PROGRAMME

❖ The programme will commence within 15 days after the declaration of Final B.Sc result by the University. In special circumstances with the permission of the head of the institute, students can start an internship within 30 days of declaration of results.

9. LEAVE FOR INTERNS

❖ An internee shall be entitled for maximum 12 days leave during a One Year period of internship posting.

An internee will not be permitted to avail more than 4 days leave in any department. Period of leave in excess of 4 days in a department will have to be extended in the same department. Under any circumstances this period will not be condoned by any authority.

❖ However if any student wants to attend any state/national/international conference, workshop or seminar then maximally 6 days study leave can be granted to the students with production of the proper documents or certificate. It should not be more than 6 days in any conditions.

10. STIPULATION FOR REPEAT POSTING IN CONCERNED DISCIPLINE:

i) Unsatisfactory performance.
ii) Prolonged illness, Medical Certificate must be validated by the parent institution.
iii) Prolonged Leave due to any reasons other than illness.
iv) Failure to submit Log book.
v) Failure to submit attendance certificate.

11. INTERNSHIP COMPLETION CERTIFICATE

The college/institute will issue Internship completion certificate to student after completion of internship as per format provided in FORM-3.

FORM-1

ATTENDANCE CERTIFICATE

Ref. No_____ Date _____

This is to certify that Mr. /Ms./Mrs._____ has satisfactory completed _____months of training in _____at _____(Name of Hospital)

[sign] _____ _____

Authorized person/ Head of the Hospital/Department

[sign] _____ _____

Principal/ Head of the Institute

FORM-2

FORMAT FOR LOGBOOK

S. No.	Patient Name	Gender	Age	Diagnosis	Procedure	Date	Incharge Name	Incharge Sign.

FORM-3

INTERNSHIP COMPLETION CERTIFICATE

Ref. No_____ Date _____

This is to certify that Mr./Ms./Mrs._____ has satisfactory completed one year of Compulsory Internship for Bachelor of Science- B.Sc. (Cardiac Care Technology) at _____(Name of the college/institute)

[sign] _____ _____

Department Dean /Principal