Total Credits: 22

Semester 3rd		**Contact Hours**			**Max Marks**		**Total Marks**	**Credits**
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**		
BCCTS1-301	Applied Anatomy, Physiology, Pharmacology in Cardiac Care	4	0	0	40	60	100	4
BCCTS1-302	Basic Electrocardiography	3	0	0	40	60	100	3
BCCTS1-303	Basic Echocardiography	2	0	0	40	60	100	2
BCCTS1-304	Community Orientation & Clinical Visit (Including related practical to the parent course) - Practical	0	0	8	60	40	100	4
BCCTS1-305	Basic Electrocardiography-Practical	0	0	2	60	40	100	1
BCCTS1-306	Basic Echocardiography-Practical	0	0	4	60	40	100	2
BCCTS1-307	Medical Bioethics & IPR	3	0	0	40	60	100	3
BCCTS1-308	Organizational Behavior	3	0	0	40	60	100	3
Total		**-**	**-**	**-**	**380**	**420**	**800**	**22**

Total Credits: 25

Semester 4th		Contact Hours			Max Marks		Total Marks	Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.		
BCCTS1-401	Development of Cardiovascular system: Fetal & Neonatal	3	1	0	40	60	100	4
BCCTS1-402	Cardiovascular diseases pertinent to Cardiac care Technology	3	0	0	40	60	100	3
BCCTS1-403	Medical Instrumentation relevant to Cardiac care	2	0	0	40	60	100	2
BCCTS1-404	CCT Directed Clinical Education-II (One month in vacation)	0	0	0	50	0	50	8
BCCTS1-405	Medical Instrumentation relevant to Cardiac care-Practical	0	0	4	60	40	100	2
BCCTS1-406	Human Rights & Professional Values/ Pursuit of Inner Self Excellence (POIS)	3	0	0	40	60	100	3
BCCTS1-407	Biostatistics and Research Methodology	3	0	0	40	60	100	3
Total		**-**	**-**	**-**	**310**	**340**	**650**	**25**

Total Credit: 21

Semester 5th		Contact Hours			Max Marks		Total Marks	Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**		
BCCTS1-501	Advanced Electrocardiography	2	0	0	40	60	100	2
BCCTS1-502	Advanced Echocardiography	2	0	0	40	60	100	2
BCCTS1-503	Invasive Cardiology	3	0	0	40	60	100	3
BCCTS1-504	Community Orientation & Clinical Visit (Including related practical's to the parent course) - Practical	0	0	8	60	40	100	4
BCCTS1-505	Advanced Electrocardiography- Practical	0	0	4	60	40	100	2
BCCTS1-506	Advanced Echocardiography- Practical	0	0	4	60	40	100	2
BCCTS1-507	Basics of Clinical Skills Learning	3	0	0	40	60	100	3
BCCTS1-508	Hospital Operation Management	3	0	0	40	60	100	3
Total		**-**	**-**	**-**	**380**	**420**	**800**	**21**

Total credit: 16

Semester 6th		Contact Hours			Max Marks		Total Marks	Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.		
BCCTS1-601	Cardiac Catheterization	2	0	0	40	60	100	2
BCCTS1-602	Pediatric Interventions	2	0	0	40	60	100	2
BCCTS1-603	CCT Directed Clinical Education-IV (240 hours)	0	0	0	50	0	50	8
BCCTS1-604	Cardiac Catheterization-Practical	0	0	4	60	40	100	2
BCCTS1-605	Pediatric Interventions - Practical	0	0	4	60	40	100	2
Total		**-**	**-**	**-**	**250**	**200**	**450**	**16**

Semester 7th		Contact Hours			Max Marks		Total Marks	Credits
Subject Code	Subject Name	L	T	P	Int	Ext		
BCCTS1-701	Project	0	0	30	0	500	**500**	**15**
Total							**500**	**15**

The candidates will be supervise by the concern faculty & and the project report will be submitted following competitions. The Viva-Voce examination shall be conducted by external expert.

Report/Thesis- 200 **Daily Evaluation – 100** **Viva-Voce - 200**

Semester 8th		Contact Hours			Max Marks		Total Marks	Credits
Subject Code	Subject Name	L	T	P	Int	Ext		
BCCTS1-801	Internship	0	0	30	0	500	**500**	**15**
Total							**500**	**15**

The candidate shall undergo internship of Six months in Cardiac care department. The internship report shall be submitted to the principal & Viva-Voce examination shall be conducted by external expert.

Report/Thesis- 200 **Daily Evaluation – 100** **Viva-Voce - 200**

Semester	Credit
1st	25
2nd	26
3rd	22
4th	25
5th	21
6th	16
7th	15
8th	15
Total	**165**

APPLIED ANATOMY, PHYSIOLOGY, PHARMACOLOGY IN CARDIAC CARE

Subject Code: BCCTS1-301 | **L T P C** | **Duration: 60(Hrs.)**
4 0 0 4

Course Objective:

- Describe the structure and function of the heart including the electrical activity involved in the normal and abnormal cardiac cycle.
- Describe the structure and function of the myocytes & function of the peripheral and coronary circulatory systems at rest and during physical activity
- Discuss Anatomy of Coronaries of Heart
- Discuss the factors which impact the cardiac output and identify those factors impacted by physical activity and environmental factors
- To understand Indication and Contraindications, Uses and Adverse effects of drugs, Mechanism of Action

Course Outcomes:

- To understand Coronary Anatomy
- To enable students, differentiate between normal heart sounds and murmurs.
- To enable students, a preliminary understanding of the circulatory system from a physiological and
- Functional perspective, as well as related terminologies.
- Students will be proficient in Pharmacology with proficient knowledge about the different drugs/medicines
- To be given in various cardiovascular diseases, dose calculation and mode of administration Also recent advances in pharmacology will play a key role in research aspect of the students.

Unit 1 **(15 hrs)**

- **Anatomy of cardiovascular system:** anatomy of arteries and arterioles, anatomy of aorta, capillaries and sinusoids, anastomoses, veins and venules, anatomy of coronary arteries: left and right
- **Physiology of cardiovascular system:** physiology of aorta, physiology of carotid bifurcation, systemic, pulmonary, coronary and portal circulation, nerve supply of the heart, major arteries and veins supplying head, neck and thorax, major arteries and veins of upper limb, major arteries and veins of pelvis and lower limb.

Unit 2 **(15 hrs.)**

- **Anatomy of heart:** surface anatomy of heart, structure of the heart, surface and borders, pericardium, myocardium and endocardium, chambers: right atrium (venous area, septum, atrial appendage), right ventricle: (inflow, atrial sinus, outflow), left atrium (venous,

ventricular septum, appendage, mv), left ventricle (inflow, body, outflow), anatomy of sa node and av node, anatomy of cardiac valves: eustachian, the besian, a-v valves, semilunar valves, valve apparatus

- **Blood vessels and hemodynamics:** regulation of blood pressure: hormonal and neural regulation, pulse and sites for pulse assessment, shock and homeostasis
- **Clinical pathologies in physiology of cvs:** coronary artery disease (cad), congestive heart failure (chf), and atherosclerosis, shock and hemorrhage, syncope, hypertension.
- **Drugs used in cardiovascular system (with its moa, adrs, indications and complications):** anti-hypertensives, anti- anginal agents, anti- failure agents, antiarrhythmic agents, antithrombotic agents

Unit 3 **(15 hrs.)**

- **General pharmacology:** sources of drugs, route of drug administration, pharmacokinetics, pharmacodynamics, first pass metabolism, ad**verse drug reactions.**
- **Drugs used in nervous system (with its moa, adrs, indications and complications):** anticholinergics & adrenergic, narcotics, sedatives & hypnotics.

Unit 4 **(15 hrs.)**

- **Miscellaneous:** Iv fluids, neuromuscular blockers, electrolyte supplements, antihistamines, protamine, emergency drugs- atropine, adrenaline, steroids, sodium bicarbonate.

Reference books

- Ross and Wilson Anatomy & Physiology in Health and Illness, 12th Edition by Anne Waugh and Allison Grant
- Principles of Anatomy & Physiology ,12th Edition by Gerard J. Tortora & Bryan Derricks
- Textbook of Physiology (Vol.1,2) Dr. A.K. Jain
- Essentials of Medical Physiology, Sixth Edition by K Sembulingam and Prema Sembulingam
- Physical Examination of the Heart and Circulation, Fourth Edition by Joseph K. Perloff
- Pharmacology for Physiotherapy by Padmaja Uday kumar.
- Drugs for the Heart, South Asia edition by Lionel H. Opie and Bernard J. Gersh
- R. S. Satoskar, S.D. Bhandarkar, S. S. Ainapure, Pharmacology and Pharmacotherapeutics, 18th Edition
- K.D. Tripathi, Essentials of Medical Pharmacology, V. Edition, M/s. Jaypee Brothers, Post Box, 7193, G-16, EMCA House, 23/23, Bansari Road, Daryaganj, New Delhi.

BASIC ELECTROCARDIOGRAPHY

Subject Code: BCCTS1-302 **L T P C** **Duration: 45 (Hrs.)**
3 0 0 3

Course Objective:

- To enable students, understand the correct placement of all electrodes.
- To demonstrate patient positioning and preparation.
- To teach students about maintenance of the ECG machine, wires and electrodes.

Course Outcomes:

- To develop understanding regarding Electrocardiography and its procedure.
- Describe the proper hook-up procedure for a 12-Lead ECG.
- Identify basic normal ECG waveform morphology and common interpretation.
- Enumerate the measures to be taken before, after and during ECG procedure.

Unit 1 **(10 hrs.)**

- **Basic electrophysiology:** Heart: An electrical field, Electrical and Mechanical properties of the heart, Cardiac electrical field generation during activation, Cardiac wave fronts - Action potential: Repolarization and Depolarization, Cardiac electrical field generation during ventricular recovery, Conduction system of the heart: In detail
- **Basics of electrode placement and lead selection and axis deviation:** Basics of Electrodes and Leads, ECG deflections: Isoelectric, Upright, Negative and Biphasic, Types of ECG leads- Standard limb leads, Precordial leads and the Wisdom central, Augmented limb leads, Unipolar V/S Bipolar leads, Placement of leads with universal color code, Hexa-axial reference frame and Electrical axis, X axis – time presentation, Y axis – voltage presentation, Right & Left axis in Normal ECG, Einthoven's Triangle, Deviation of Axis.
- **BASICS OF STRESS TEST:** Protocols, lead placement, instruction to the patient, rhythm analysis.

Unit 2 **(15 hrs.)**

- **ECG COMPONENTS-WAVES AND INTERVALS:** ECG waveforms: Rate, Rhythm and Normal time intervals-The Normal Electrocardiogram, the Normal P wave & atrial repolar-ization, Atrioventricular node conduction and the PR segment, Ventricular activation and the QRS Complex, Genesis of QRS complex, Ventricular recovery and ST-T wave, Normal variants and Rotation of the heart, ECG PAPER, Rate measurement: Six second method, large box method, Small box method
- **Sinus rhythms & atrioventricular blocks (Description, Possible causes, ECG Criteria, Plan of assessment, Potential treatments):** Normal Sinus Rhythm, Sinus Bradycardia, Sinus Tachycardia, 1st Degree AV block, 2nd Degree AV block: Type-I or Mobitz-I, 2nd Degree AV

block: Type-II or Mobitz-II, 3rd Degree AV block/ CHB.

Unit 3 **(05 hrs.)**

- **Basics of ecg interpretation:** basic steps for interpretation- Rate, Rhythm, P-wave Examination, P to R interval, QRS width, Rhythm interpretation.

Unit 4 **(15 hrs.)**

- **Atrial & ventricular arrhythmias (Description, Possible causes, ECG criteria, Plan of assessment, Potential treatments):** Premature Atrial Contractions (PACs), Atrial Flutter (AF), Atrial Fibrillation (A. Fib), Paroxysmal Atrial Tachycardia, Premature Ventricular Contractions (PVCs), Ventricular Tachycardia (V. Tach), Supraventricular Tachycardia (SVT), Ventricular Fibrillation (V. Fib), Asystole.

Reference books

- ECG Made Easy – Atul Luthra
- Reference by PGDCC – IGNOU Handbooks for ECG, ECHO and Stress Test
- An Introduction to Electrocardiography: Schamroth Colin
- Clinical Electrocardiography: Goldberger. A

BASIC ELECTROCARDIOGRAPHY PRACTICAL

Subject Code-BCCTS1-305 | **L T P C** | **Duration: 30 (Hrs.)**
0 0 2 1

Course Objective:

- To enable students, understand the correct placement of all electrodes.
- To demonstrate patient positioning and preparation.
- To teach students about maintenance of the ECG machine, wires and electrodes.

Course Outcomes:

- To develop understanding regarding Electrocardiography and its procedure.
- Describe the proper hook-up procedure for a 12-Lead ECG.
- Identify basic normal ECG waveform morphology and common interpretation.
- Enumerate the measures to be taken before, after and during ECG procedure.

Experiments

- Steps to perform an ECG
- Patient positioning according to various conditions.
- Proper communication with patient to find out the history
- ECG machine operating and maintenance
- Maintain ECG catalog for self-assessment
- Common errors in ECG recording

Reference books

- ECG Made Easy – Atul Luthra
- Reference by PGDCC – IGNOU Handbooks for ECG, ECHO and Stress Test
- An Introduction to Electrocardiography: Schamroth Colin
- Clinical Electrocardiography: Goldberger. A

BASIC ECHOCARDIOGRAPHY

Subject Code: BCCTS1-303 | **L T P C** | **Duration: 30 (Hrs.)**
2 0 0 2

Course Objective:

- To provide a brief introduction to Echocardiography, its techniques and types of Echocardiography.
- To provide practically and clinically useful application of Echocardiography.
- To explain echo techniques available and to put echo into a clinical perspective

Course Outcomes:

- To develop an understanding regarding Echocardiography.
- To train students to perform Echocardiography examinations by explaining the position of transducers.
- To make students aware of recent advances in Echocardiography.
- To understand the role of Cardiac Care technician while assisting the Cardiologist as well as when performing individually.

Unit 1 **(10 hrs.)**

- **Introduction to echocardiography:** basics of ultrasound waves, characteristics of: sound wave, frequency and attenuation, basic principle of echocardiography, indications of echocardiography, types of echocardiography, importance of gel in echocardiography.
- **Murmurs:** types of murmurs heard in echocardiography- systolic and diastolic murmurs, possible causes of murmurs, conditions associated with murmurs, features of murmurs suggesting echocardiography.
- **Echocardiography techniques:** basic principles, indications and uses of: 2d transthoracic echocardiography, m-mode, echo windows and views used in transthoracic echocardiography, doppler echocardiography in detail: pulsed, continuous wave and color flow mapping.
- **Knobology and instrumentation:** transducer: basic principle and working, types of transducers, piezoelectric crystals and its effect, various knobs used on echo machine with its description and application.
- **Cardiac assessment:** measurement of cardiac dimensions, basics of: evaluation of systolic and diastolic left ventricular function, ejection fraction, fractional shortening, and regional wall motion abnormalities: classification, stroke volume and cardiac output assessment, transvalvular gradients and orifice area.

Unit 2 **(10 hrs.)**

- **Doppler effect:** basics of doppler, applications of doppler, types of doppler, continuity equation
- **Echocardiography assessment in valvular heart disease:** Role Of Echo In Assessment Of

Valvular Heart Diseases, 2D Findings, Doppler Calculations, M-Mode Findings And Views Seen In: Mitral Regurgitation, Mitral Stenosis With Different Types Of M-Mode Pattern, Mitral Valve Prolapse, Aortic Regurgitation, Aortic Stenosis: Types Of AS, Infective Endocarditis, Tricuspid Regurgitation, Tricuspid Stenosis, Pulmonary Regurgitation, Pulmonary Stenosis.

Unit 3 **(5 Hrs.)**

- **Basics of toe, stress echo & contrast echo:** advantages & disadvantages, applications, indications & contraindications, complications, patient positioning and medications used.
- **Echo in special hospital settings:** clinical uses of echocardiography in: preoperative cases, intraoperative cases, intensive care unit (icu), coronary care unit (ccu), cardiac catheterization laboratory (ccl), accident &emergency (a&e) department, portable (hand-held) echo.
- **Echo assessment in cad:** assessment of ischemia, assessment of myocardial infarction, complications Of MI Detection By Echo, Myocardial Hibernation.

Unit 4 **(05 Hrs.)**

- **Artificial (prosthetic) valves:** Basics Of Artificial Valves, Types Of Artificial Valves, Echo Examination Of Prosthetic Valve, Basics Of Prosthetic Valve Malfunction, Echo Assessment Of: Endocarditis, Thrombus, Dehiscence, Regurgitation, Variance, Degeneration.
- **Hypertension and lvh:** Indications For Echo In Hypertension, Echo Findings In Hypertension, Left Ventricular Hypertrophy: Echo Findings.
- **Screening and follow-up echo:** Good Indications For Screening Echo, Less Clear-Cut Indications For Screening Echo, Follow-Up Echo.

Reference Books

- Echo made easy: sam kaddoura
- Reference by pgdcc – ignou handbooks for ecg, echo and stress test.
- Feigen baum's echocardiography
  Tajik jamil for echocardiography

BASIC ECHOCARDIOGRAPHY PRACTICAL

Subject Code: BCCTS1-306

L	T	P	C
0	0	4	2

Duration: 60 (Hrs.)

Course Objective:

- To provide a brief introduction to Echocardiography, its techniques and types of Echocardiography.
- To provide practically and clinically useful application of Echocardiography.
- To explain echo techniques available and to put echo into a clinical perspective

Course Outcomes:

- To develop an understanding regarding Echocardiography.
- To train students to perform Echocardiography examinations by explaining the position of transducers.
- To make students aware of recent advances in Echocardiography.
- To understand the role of Cardiac Care technician while assisting the Cardiologist as well as when performing individually.

Experiments

- Learn about Probe and Scanner settings.
- Learn about Structural and Functional assessment of the heart.
- Learn about various windows and views used in Echocardiography
- Learn about qualitative reporting systems along with various software's associated with Echo reporting.

Reference Books

- Echo made easy: sam kaddoura
- Reference by pgdcc – ignou handbooks for ecg, echo and stress test.
- Feigen baum's echocardiography
- Tajik jamil for echocardiography.

COMMUNITY ORIENTATION & CLINICAL VISIT (INCLUDING RELATED PRACTICAL TO THE PARENT COURSE) PRACTICAL

Subject Code: **BCCTS1-304**

L	T	P	C
0	0	8	4

Duration: 240 (Hrs.)

Students will gain additional skills in medical equipment and radiation safety techniques. Students apply knowledge from previous clinical learning experience under the supervision of a senior technologist.

Students are tested on intermediate technical skills.

MEDICAL BIOETHICS & IPR

Subject Code: BCCTS1-307	L	T	P	C	Duration: 45 (Hrs.)
	3	0	0	3	

Course Objective:

- To introduce the wide range of ethical issues in healthcare.
- To provide basic skills in: A) Approaching ethical issues. B) Analysis and statement of issues. C) Understanding the relevant ethical principles invoked.
- Imparting knowledge and skills that will enable students to develop ethical answers to these issues
- To acquire specialized knowledge of law and IPR.
- The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.

Course Outcomes:

- Upon successful completion of the course, students will be able to: Recognize what constitutes an ethical concern in health care.
- Understanding ethical issues in health care.
- Understand better the complexity and multi-dimensionality of medical ethical concerns and uniqueness of each problem.
- Capacity to rationally justify your decision.
- Develop the ability to reason through difficult medical/clinical ethical issues both orally, in the context of a group of their peers, and through written.
- The students get awareness of acquiring the patent and copyright for their innovative works.
- They also get the knowledge of plagiarism in their innovations which can be questioned legally.

Unit 1 **(05 hrs.)**

- Introduction to Bioethics.
- Bioethical issues related to Healthcare & Medicine.

Unit 2 **(15hrs.)**

- **Anatomy -** Cadaver ethics, Human dignity, PNDT, Disposal of cadaver, Genetic Counseling.
- **Physiology -** Animal ethics, Health policy privacy.

Unit 3 **(15 hrs.)**

- **Biochemistry & Pathology -** Prudence of investigation confidentiality, Patients bill of rights, Disposal of investigative material, Integrity, Blood transfusion
- **Pharmacology -** Rational drug prescribing, Clinical trials, Risk minimization, Animal ethics

Unit 4 **(10 hrs.)**

- **Medico legal aspects of medical records**
- **Introduction to Intellectual Property:** Concept of Intellectual Property Kinds of Intellectual Property Patents, Copyrights Designs, Trademarks, Geographical Indication, Infringement of IPR, Its protection and Remedies Licensing and its types

Reference Books:

- Contemporary issues in bioethics – Beauchamp & Walters (B&W) 4th edition.
- Classic philosophical questions by Gloud (8^{th} Edition)
- Case book series and booklets by UNESCO Bioethics Core curriculum 2008
- Encyclopedia of Bioethics 5 vol set, (2003) ISBN-10: 0028657748
- Intellectual property rights- Ganguli-Tat McGrawhill. (2001) ISBN-10: 0074638602,
- Intellectual Property Right- Wattal- Oxford Publication House. (1997) ISBN: 0195905024

ORGANIZATIONAL BEHAVIOR

Subject Code: BCCTS1-308 | **L T P C** | **Duration: 45(Hrs.)**
3 0 0 3

Course Objective:

- To understand the initial insights into underlying principles and fundamental theories of organizational behavior.
- The Student should develop a sense of what falls under the domain of organizational behavior.
- He should develop an understanding of academic views on the behavior and motivations of people in organizations and the purposes of organizations.
- This course clearly takes an academic and scientific lens with the aim of understanding human behavior in organizations.

Course Outcomes:

- Describe and apply motivation theories to team and organizational scenarios in order achieve a team's or an organization's goals and objectives.
- Explain the effect of personality, attitudes, perceptions and attributions on their own and other's behaviors in team and organizational settings.
- Explain types of teams and apply team development, team effectiveness, and group decision making models and techniques.
- Analyze and apply leadership theories and better understand their own leadership style.

Unit 1 **(5 hrs.)**

- **Organizational Behavior** - Definition - Importance - Historical Background – Fundamental concepts of OB- 21st Century corporate - Different models of OB i.e. autocratic, custodial, supportive

Unit 2 **(15 hrs.)**

- **Organization Structure and Design** - Authority and Responsibility Relationships – Delegation of Authority and Decentralization - Interdepartmental Coordination - Emerging Trends in Corporate Structure, Strategy and Culture - Impact of Technology on Organizational design - Mechanistic vs Adoptive Structures – Formal and Informal Organization

Unit 3 **(5 hrs.)**

- **Perception Process** - Nature & Importance - Perceptual Selectivity - Perceptual Organization - Social Perception - Impression Management

Unit 4 **(20 hrs.)**

- **Learning -** Process of Learning - Principles of Learning - Organizational Reward Systems – Behavioral Management
- **Motivation - Motives -** Characteristics - Classification of motives - Primary Motives - Secondary motives - Morale - Definition and relationship with productivity – Morale Indicators

- **Leadership -** Definition - Importance - Leadership Styles - Models and Theories of Leadership Styles
- **Conflict Management -** Traditional vis-a-vis Modern view of conflict - Constructive and Destructive
- **Conflict –** Conflict Process - Strategies for encouraging constructive conflict - Strategies for resolving destructive conflict.

Reference Books:

- Organizational Behavior, 9th Ed. - Stephen Robbins.
- Human Behavior at work - Davis and Newstrom
- Organizational Behavior - Uma Sekaran
- Organizational Behavior - Fred Luthans
- Organizational Behavior - K.Aswathappa
- Human Behavior at Work - Keith Davis
- Organizational Behavior - Jit S.Chandran
- Human Relations & Organizational Behavior - R.S.Dwivedi
- Organizational Behavior - McShane

4th Semester

DEVELOPMENT OF CARDIOVASCULAR SYSTEM: FETAL & NEONATAL

Subject Code: BCCTS1-401 **L T P C** **Duration: 60(Hrs.)**
3 1 0 4

Course Objective:

- To understand the description of fate of certain fetal structures onc postnatal circulation is established.
- To provide an outline of Cardiovascular Anatomy to improve the student's understanding of the technical and diagnostic procedures used with special emphasis on applied aspects in Cardiology

Course Outcomes:

- This course will provide overall information of the structural development of the cardiovascular system.
- To encourage students to apply this knowledge to understand developmental anomalies in the Cardiovascular System.

Unit1 **(15 hrs.)**

- **Early development of embryo:** Early development of embryo, Early blood vessel formation, Intra-embryonic blood vessel, Extra-embryonic blood vessel.
- **Development of the heart:** Formation and position of the heart tube, Formation and position Of the heart loop, Mechanism of cardiac looping, Formation of the embryonic ventricle, Development of the sinus venous, Formation of the cardiac septa, Atrial septation, the atrio-ventricular canal, the Muscular interventricular septum, the septum in truncus arteriosus and the cord is conus.

Unit 2 **(15 hrs.)**

- **Formation of the cardiac valves:** Formation of the cardiac valves, The Atrioventricular Valve, The semilunar valve.
- **Formation of the great systemic veins:** The cardiac veins, The vitelline veins, The Umbilical veins, the vena cava.

Unit 3 **(15 hrs.)**

- **Fetal & neonatal circulation:** Blood flow pattern, oxygenation & venous return to the Heart, Cardiac output and its distribution, Intra - cardiac vascular pressure, Myocardial function & its Energy metabolism

- **Characteristics of fetal circulation and changes occur at birth:** Postnatal Circulation In Detail

Unit 4 **(15 hrs.)**

- **Etiology of cardiovascular malformation:** Congenital anomalies in detail
- **Adult circulation:** Systemic Circulation, Pulmonary Circulation.

Reference Books:

- Ross and Wilson Anatomy & Physiology in Health and Illness, 12th Edition by Anne Waughand Allison Grant
- Principles of Anatomy & Physiology ,12th Edition by Gerard J. Tortora & Bryan Derrickson
- Human Embryology; Inderbir Singh

CARDIOVASCULAR DISEASES PERTINENT TO CARDIAC CARE TECHNOLOGY

Subject Code: BCCTS1-402 | **L T P C** | **Duration: 45 (Hrs.)**
3 0 0 3

Course Objective:

- To know the Definition and Pathophysiology of Cardiovascular diseases Classification, Etiology, Clinical features, Diagnosis & Management of Diseases

Course Outcomes:

- This course will cover common Cardiovascular Diseases, their related pathology and microbiology.
- Along with outline of clinical presentation and management of these conditions it also includes Medical and Surgical interventions

Unit 1 **(10 hrs.)**

- **Valvular heart disease:** Acquired Valvular heart disease, Rheumatic fever and Rheumatic heart disease: Aortic stenosis, Aortic regurgitation, Mitral valve disease, Mitral stenosis, Mitral Regulation, Combined valvular heart disease, Tricuspid valve disease, Infective Endocarditis.
- **Coronary artery disease:** Pathophysiology and clinical recognition of Angina Pectoris, Pathophysiology of Coronary Artery Disease, Myocardial Infarction, Treatment for Coronary Artery Disease.

Unit 2 **(15 hrs.)**

- **Hypertension:** Etiology of Hypertension, Systemic hypertension, Essential and secondary Hypertension, Treatment for hypertension, DASH diet, Pulmonary Hypertension, Pulmonary thrombo-embolism
- **Heart failure:** Types of Heart failure- Left, Right, Biventricular, Acute Decompensated Heart Failure, Pathophysiology of Heart failure, Causes, Signs and symptoms, Medical management, surgical treatment.
- **Myocardial diseases:** Dilated cardiomyopathy, Hypertrophic cardiomyopathy, Restrictive cardiomyopathy, Myocarditis.

Unit 3 **(15 hrs.)**

- **Congenital heart diseases:** Acyanotic heart disease -Atrial septal defect (ASD),Ventricular septal defect (VSD), Patent ductus arteriosus (PDA), Coarctation of Aorta (coa),Cyanotic congenital heart disease - Tetralogy of Fallot (TOF), Double Outlet Right Ventricle(DORV), Pulmonary Atresia, Transposition of Great Arteries (TGA), Total Anomalous Pulmonary, Venous Connection (TAPVC).
- **Pericardial diseases:** Pericardial effusion, Constrictive pericarditis, Cardiac tamponade, Pericardiocentesis.

Unit 4 **(05 hrs.)**

- **Peripheral vascular disease:** Atherosclerotic peripheral vascular disease, Aortic aneurysms, Aortic dissection, Takayasu's arteritis
- **Cardiac arrest:** Classification, 6 H's and 6 T's, Signs and Symptoms, Diagnosis, Treatment
- **COPD:** Causes, Stages of COPD (Stage 1-4),Signs and Symptoms, Diagnosis, Treatment: Medication, Dietary changes, Lifestyle changes.

Reference book

- Ross and Wilson Anatomy & Physiology in Health and Illness, 12th Edition by Anne Waugh and Allison Grant
- Principles of Anatomy & Physiology ,12th Edition by Gerard J. Tortora& Bryan Derrickson
- Essentials of Medical Physiology, Sixth Edition by K Sembulingam and Prema Sembulingam
- Physical Examination of the Heart and Circulation, Fourth Edition by Joseph K. Perloff

MEDICAL INSTRUMENTATION RELEVANT TO CARDIAC CARE

Subject Code: BCCTS1-403 **L T P C** **Duration: 30 (Hrs.)**
2 0 0 2

Course Objective:

- To introduce Biomedical applications of different transducers used.
- To introduce the student to the various sensing and measurement devices of electrical origin.
- To provide awareness of electrical safety of medical equipment.
- To provide the latest ideas on devices of non-electrical devices.
- To bring out the important and modern methods of imaging techniques.
- To provide latest knowledge of medical assistance / techniques and therapeutic equipment.

Course Outcomes:

- The course is designed to make the student acquire an adequate knowledge of the physiological systems of the human body and relate them to the parameters that have clinical importance.
- The fundamental principles of equipment that are actually in use at the present day are introduced.
- The healthcare industry or they will be the best helping hand for biomedical engineers.

Unit 1 **(05 hrs.)**

- **Introduction to medical physics:** Basics, Indications, Outcome, Machines related to Medical Physics.

Unit 2 **(10 hrs.)**

- **Electro–physiological measurements:** Electrodes – Limb electrodes, floating electrodes, pregelled disposable electrodes, Microneedle and surface electrodes, ECG: Lead systems and recording methods, Typical waveforms, Electrical safety in medical environment: shock hazards, leakage current, Instruments for checking safety parameters of biomedical equipment, Transducers: selection criteria, Piezoelectric ultrasonic transducers.

Unit 3 **(10 hrs.)**

- **Non-electrical parameter measurements:** Measurement of blood pressure, Cardiac output, Stethoscope: Heart rate, Heart sound, ACT, Pulmonary function measurements – Spirometer, Photoplethysmography, Body Plethysmography, Blood Gas analyzers: ph of blood, measurement of blood pco2, po2, finger-tip oximeter - ESR, GSR measurements.

Unit 4 **(05 hrs.)**

- **Assisting and therapeutic equipments:** Types of Pacemakers, Types of Defibrillators, Ventilators- Types of Ventilators
- **Medical imaging:** C-Arm, Coronary Computer tomography & MRI, TLD, Radiographic and fluoroscopic techniques: Echocardiography: TTE, TEE, Stress Echo, Coronary Angiography, PTCA

Reference books

- R. S. Khandpur, 'handBook Of Biomedical Instrumentation', Tata Mcgraw Hill Publishing Co Ltd.,2003.
- Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, 'bio-Medical Instrumentation And Measurements', Ii Edition, Pearson Education, 2002
- M. Arumugam, 'Biomedical Instrumentation', Anuradha Agencies, 2003.
- L.A. Geddes and L.E. Baker, 'Principles of Applied Biomedical Instrumentation', John Wiley & Sons, 1975.
- J. Webster, 'Medical Instrumentation', John Wiley & Sons, 1995.
- C. Raja Rao and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation', Universities press (India) Ltd, Orient Longman ltd, 2000.

CCT DIRECTED CLINICAL EDUCATION – II (ONE MONTH IN VACATION)

Subject Code: BCCTS1-404 **Duration: 240 (Hrs.)**

Students will gain additional skills in medical equipment and radiation safety techniques. Students apply knowledge from previous clinical learning experience under the supervision of a senior technologist. Students are tested on intermediate technical skills.

MEDICAL INSTRUMENTATION RELEVANT TO CARDIAC CARE PRACTICAL

Subject Code: BCCTS1-405 **L T P C** **Duration: 60 (Hrs.)**
0 0 4 2

Course Objective:

- To introduce Biomedical applications of different transducers used.
- To introduce the student to the various sensing and measurement devices of electrical origin.
- To provide awareness of electrical safety of medical equipment.
- To provide the latest ideas on devices of non-electrical devices.
- To bring out the important and modern methods of imaging techniques.
- To provide latest knowledge of medical assistance / techniques and therapeutic equipment.

Course Outcomes:

- The course is designed to make the student acquire an adequate knowledge of the physiological systems of the human body and relate them to the parameters that have clinical importance.
- The fundamental principles of equipment that are actually in use at the present day are introduced.
- The healthcare industry or they will be the best helping hand for biomedical engineers.

Experiments

1. ECG Machine
2. Stress Test Machine
3. Patient monitor
4. Central Monitoring System
5. Sphygmomanometer
6. Pulse Oximeter
7. Stethoscope
8. Defibrillators
9. Pressure transducers
10. Techniques of monitoring radiation exposure

Reference books

- R. S. Khandpur, ‘handBook Of Biomedical Instrumentation’, Tata Mcgraw Hill Publishing Co Ltd.,2003.
- Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, ‘bio-Medical Instrumentation And

Measurements', Ii Edition, Pearson Education, 2002
- M. Arumugam, 'Biomedical Instrumentation', Anuradha Agencies, 2003.
- L.A. Geddes and L.E. Baker, 'Principles of Applied Biomedical Instrumentation', John Wiley & Sons, 1975.
- J. Webster, 'Medical Instrumentation', John Wiley & Sons, 1995.
- C. Raja Rao and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation', Universities press (India) Ltd, Orient Longman ltd, 2000.

HUMAN RIGHTS & PROFESSIONAL VALUES/ PURSUIT OF INNER SELF EXCELLENCE (POIS)

Subject Code: BCCTS1-406 | **L T P C** | **Duration: 45 (Hrs.)**
3 0 0 3

Course Objective:

- To understand interaction between society and educational institutions.
- To sensitize the citizens so that the norms and values of human rights and duties of education programmes are realized.
- To encourage research activities.
- To encourage research studies concerning the relationship between Human Rights and Duties Education.

Course Outcomes:

- This course will aim at making the learners acquire conceptual clarity and develop respect for norms and values of freedom, equality, fraternity and justice.
- It will include awareness of civil society organizations and movements promoting human rights.
- This will make the students realize the difference between the values of human rights and their duties

Unit 1 **(05 hrs.)**

- **Background** - Introduction, Meaning, Nature and Scope, Development of Human Rights, Theories of Rights, Types of Rights

Unit 2 **(15 hrs.)**

- **Human rights at various level-** Human Rights at Global Level UNO
- **Instruments:** U.N. Commission for Human Rights, European Convention on Human Rights.
- **Human rights in India** - Development of Human Rights in India, Human Rights and the Constitution of India, Protection of Human Rights Act 1993- National Human Rights Commission, State Human Rights Commission, Composition Powers and Functions, National Commission for Minorities, SC/ST and Woman

Unit 3 **(15 hrs.)**

- **Human Rights Violations** -Human Rights Violations against Women, Children, Violations against Minorities SC/ST and Trans-genders, Preventive Measures.
- **Professional values**- Integrity, Objectivity, Professional competence and due care, Confidentiality
- **Personal values**- ethical or moral values, Attitude and behavior- professional behavior, treating people Equally

Unit 4 **(10hrs.)**

- **Code of conduc**t- professional accountability and responsibility, misconduct, Cultural issues in the Healthcare environment

Reference Books:

- Jagannath Mohanty Teaching of Humans Rights New Trends and Innovations Deep & Deep Publications Pvt. Ltd. New Delhi2009
- Ram Ahuja: Violence Against Women Rawat Publications Jewahar Nager Jaipur.1998.
- Sivagami Paramasivam Human Rights Salem 2008
- Hingorani R.C.: Human Rights in India: Oxford and IBH New Delhi.

BIOSTATISTICS AND RESEARCH METHODOLOGY

Subject Code: BCCTS1-407 **L T P C** **Duration: 45 (Hrs.)**
3 0 0 3

Course Objective:

- To enable students to present, analyze and interpret data.
- To enable students to use concepts of probability in business situations.
- To enable students to make inferences from samples drawn from large datasets.
- To enable students to apply univariate and multivariate statistical techniques.

Course Outcomes:

- To understand the importance & Methodology for research.
- To learn in detail about sampling, probability and sampling distribution, significance tests correlation an regression, sample size determination, study design and multivariate analysis.

Unit 1 **(15 hrs.)**

- **Introduction:** Statistics, Biostatistics, Frequency distribution Measures of central tendency: Mean, Median, Mode- Pharmaceutical examples
- **Measures of dispersion:** Dispersion, Range, standard deviation
- **Correlation:** Definition, Karl Pearson's coefficient of correlation, Multiple correlation

Unit 2 **(15 hrs.)**

- **Regression:** Curve fitting by the method of least squares, fitting the lines y= a + bx and x = a + by, Multiple regression, standard error of regression–
- **Probability:** Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties - problems Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples Parametric test: t-test(Sample, Pooled or Unpaired and Paired) , ANOVA, (One way and Two way), Least Significance difference

Unit 3 **(05 hrs.)**

- **Non Parametric tests:** Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test

- **Introduction to Research:** Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism

Unit 4 **(10 hrs.)**

- **Graphs:** Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph

- **Designing the methodology:** Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.

Reference Books:

- Mausner & bahn : Epidemiology-An Introductory text, 2nd Ed.,W.B.Saunders Co.
- Richard f. Morton & j. Richard hebd : A study guide to Epidemiology and Biostatistics, 2nd Ed., University Park Press, Baltimore.
  Sylvia W Smoller, J Smoller, Biostatistics & Epidemiology A Primer for health and Biomedical professionals, 4th edition, Springs, 2015

5th Semester

ADVANCED ELECTROCARDIOGRAPHY

Subject Code: BCCTS1-501 | **L T P C** | **Duration: 30 (Hrs.)**
2 0 0 2

Course Objective:

- To enable students, understand various arrhythmias.
- To demonstrate patient positioning and preparation.
- To teach students about maintenance of the ECG machine, wires and electrodes.

Course Outcome

- To develop an understanding regarding Echocardiography.
- To train students to perform Echocardiography examinations by explaining the position of transducers.
- To make students aware of recent advances in Echocardiography.
- To understand the role of Cardiac Care technician while assisting the Cardiologist as well as when performing individually.

Unit 1 **(05 hrs.)**

- **Anatomy of the conduction system & basics of electrophysiology:** SA node, AV node, Inter nodal and Inter-atrial conduction, Bundle branches, History, Equipment used, Procedure, Resting interval measurements, Management of Arrhythmias by EP study.

Unit 2 **(10 hrs.)**

- **Genesis of cardiac arrhythmias and management:** Various Mechanisms of Arrhythmogenesis & disorders of impulse formation: Artifacts, Electrical interference, Somatic tremor, Wandering baseline, Antiarrhythmic agents class I, class II, class III, class IV, Implantable electric devices for treatment of cardiac arrhythmias, Ablation theory for cardiac arrhythmias: Basic
- **ECG in ischemic heart disease:** Coronary events and ECG, ECG changes in IHD and Myocardial Infarction, Investigations: Stress test- Indications, Contraindications, Pre-test probability, Exercise Protocols, Interpretation of reports.

Unit 3 **(10 hrs.)**

- **Disorders of impulse conduction:** Reentry mechanism, Tachycardia caused by reentry, Electrical remodeling of atria, Sinus reentry, Atrial reentry, AV node reentry, Pre-excitation syndrome, Ventricular tachycardia caused by reentry, PACEMAKERS: Types of Pacemakers, Components of Pacemaker, Single and Double Timing cycles, Pacemaker Troubleshooting

Unit 4 **(05 hrs.)**

- **Cardiac pacing & radiofrequency ablation therapy:** Indications, Temporary and Permanent Pacing, NBG codes, Types of Pacing, Complications, Common sites **o**f Ablation, Management of A. Flutter, V. Tach, A. Fib, AVNRT

Reference books

- ECG Made Easy –Atul Luthra
- Reference by PGDCC – IGNOU Handbooks for ECG, ECHO and Stress Test.
- Hampton J. 2003, The ECG made Easy (6th ed.) Churchill Livingstone, Edinburgh
- An Introduction to Electrocardiography: Schamroth Colin
- Clinical Electrocardiography: Goldberger. A
- Reference by PGDCC – IGNOU Handbooks for ECG, ECHO and Stress Test.

ADVANCED ELECTROCARDIOGRAPHY-PRACTICAL

Subject Code: BCCTS1-505 **L T P C** **Duration: 60 (Hrs.)**
0 0 4 2

Course Objective:

- To enable students, understand various arrhythmias.
- To demonstrate patient positioning and preparation.
- To teach students about maintenance of the ECG machine, wires and electrodes.

Course Outcome

- To develop an understanding regarding Echocardiography.
- To train students to perform Echocardiography examinations by explaining the position of transducers.
- To make students aware of recent advances in Echocardiography.
- To understand the role of Cardiac Care technician while assisting the Cardiologist as well as when performing individually.

Experiments

- Learn about 12-lead ECG
- Learn about various software's associated with ECG.
- Learn various conditions indicated for Electrocardiography

Reference books

- ECG Made Easy –Atul Luthra
- Reference by PGDCC – IGNOU Handbooks for ECG, ECHO and Stress Test.
- Hampton J. 2003, The ECG made Easy (6th ed.) Churchill Livingstone, Edinburgh
- An Introduction to Electrocardiography: Schamroth Colin
- Clinical Electrocardiography: Goldberger. A

- Reference by PGDCC – IGNOU Handbooks for ECG, ECHO and Stress Test.

ADVANCED ECHOCARDIOGRAPHY

Subject Code: BCCTS1-502 **L T P C** **Duration: 30 (Hrs.)**
2 0 0 2

Course Objective:

- To provide a brief introduction to Echocardiography, its techniques and types of Echocardiography.
- To provide practically and clinically useful application of Echocardiography.
- To explain echo techniques available and to put echo into a clinical perspective.

Course Outcomes:

- To develop an understanding regarding Echocardiography.
- To train students to perform Echocardiography examinations by explaining the position of transducers.
- To make students aware of recent advances in Echocardiography**.**
- To understand the role of Cardiac Care technician while assisting the Cardiologist as well as when performing individually.

Unit 1 **(5 hrs.)**

- **Heart failure, myocardium and pericardium:** heart failure, assessment of lv systolic function, coronary artery disease, cardiomyopathies and myocarditis, diastolic function, right heart and lungs, long-axis function, pericardial disease, device therapy for heart failure – cardiac resynchronization therapy.

Unit 2 **(10 hrs.)**

- **Transesophageal echocardiography:** standard views used in toe, indications for toe, advantages and disadvantages of toe, patient preparation and care during toe, uses of toe, contraindications to toe, complications of toe,
- **Cardiac masses, infection and congenital abnormalities:** cardiac masses - tumors (primary or secondary), thrombus, infected material (vegetation or abscess), congenital abnormalities- shunts: asd, vsd, pfo, coarctation of the aorta, congenital valvular abnormalities- ebstein's anomaly, pulmonary stenosis, bicuspid aortic valve.

Unit 3 **(10 hrs.)**

- **Special situations and conditions:** Pregnancy, Rhythm disturbances: A.Fib, V. Fib, Syncope, Palpitations, LVH, Stroke, TIA and Thromboembolism, Breathlessness and Peripheral edema.
- **Echo abnormalities in some systemic diseases and conditions:** HIV infection and AIDS, Chagas' disease, Lyme disease, Rheumatic heart disease, Obesity.

Unit 4 **(05 hrs.)**

- **Recent advances in echocardiography:** 3D Echo, 4D Echo, Tissue Doppler Imaging.

Reference Book:

- **E**cho Made Easy: Sam Kaddoura Reference by PGDCC – IGNOU Handbooks for ECG, ECHO and Stress Test.
- Feigen Baum's Echocardiography, Tajik Jamil for Echocardiography.

ADVANCED ECHOCARDIOGRAPHY PRACTICAL

Subject Code: BCCTS1-506 **L T P C** **Duration: 60 (Hrs.)**
0 0 4 2

Course Objective:

- To provide a brief introduction to Echocardiography, its techniques and types of Echocardiography.
- To provide practically and clinically useful application of Echocardiography.
- To explain echo techniques available and to put echo into a clinical perspective.

Course Outcomes:

- To develop an understanding regarding Echocardiography.
- To train students to perform Echocardiography examinations by explaining the position of transducers.
- To make students aware of recent advances in Echocardiography**.**
- To understand the role of Cardiac Care technician while assisting the Cardiologist as well as when performing **individually.**

Experiments

1. Learn about advanced Echo settings.
2. Learn about qualitative reporting systems along with various software's associated with Echo reporting.
3. Learn various conditions indicated for Echocardiography

Recommended Text Books:

- **E**cho Made Easy: Sam Kaddoura Reference by PGDCC – IGNOU Handbooks for ECG, ECHO and Stress Test.
- Feigen Baum's Echocardiography, Tajik Jamil for Echocardiography.

INVASIVE CARDIOLOGY

Subject Code: BCCTS1-503 | **L T P C** | **Duration: 45 (Hrs.)**
3 0 0 3

Course Objective:

- To enable students, understand new techniques for procedures in and around the heart emerge that again Need expert knowledge and manual dexterity**.**
- To understand such interventions which include diagnostic and therapeutic electrophysiology; implantation Or exchange of complex pacemaker systems or percutaneous cardioverter-defibrillator-pacers; Percutaneous valve repairs or replacements etc**.**

Course Outcomes: To enable students to not only be a helping hand to those just starting out in the specialty but also to serve as a reference for those who have been working in Invasive field for some time

Unit 1 **(15 hrs.)**

- **Contrast media:** basics, definition of hydrophilicity, osmolarity, and viscosity, contrast agents used in the ccl, uses, complications, contrast medium reactions: mild, moderate, severe, allergies: anaphylactic and anaphylactoid reaction, contrast-induced nephropathy (cin)
- **Hemodynamics:** introduction to hemodynamics, pressure measurement system, sources of error and artifacts: fluid artifacts, electronic and electrical artifacts, human error: leveling and balancing, slope calibration, hemodynamic waveforms, gradient, valve area calculations, cardiac output formulas- fick, ejection fraction.

Unit 2 **(05 hrs.)**

- **Ivus:** history, angiography vs. Ivus, ivus systems, diagnostic applications of ivus, complications of ivus, optical coherence tomography (oct)
- **Functional assessment of coronary disease:** intravascular pressure measurement: coronary pressures and fractional flow reserve

Unit 3 **(15 hrs.)**

- **Ptca:** history, indications, materials used, types of angioplasty balloons (otw, soe, fixed-wire
- Balloons, perfusion balloons, compliant and non-compliant balloons, stent implantation, contraindications, complications.
- **Ic hardwares: stents:** composition, types, guidewires: composition, types, catheters:

diagnostic

- And guiding.
- **Iabp and other cardiac assist devices:** iabp- physiologic principles of counter pulsation, indications, contraindications, insertion, timing: timing errors, troubleshooting, weaning and balloon removal, complications.
- **Basics of percutaneous ventricular assist devices:** tandem heart, impella, percutaneous coronary bypass

Unit 4 **(10 hrs.)**

- **Peripheral carotid angiography:** introduction, cerebrovascular anatomy and pathology, diagnosis and patient selection, patient preparation, diagnostic procedure, post procedure care.
- **Cardiac pharmacology:**local anesthetics, analgesics and sedatives: opioids, morphine, fentanyl, diazepam, midazolam, lorazepam, vasodilators: nitroglycerine, sodium nitroprusside, beta receptor blockers: metoprolol, propranolol, esmolol, labetalol, calcium channel blockers: diltiazem, verapamil, nicardipine, anticoagulation agents: platelet aggregation inhibitors, aspirin, clopidogrel, glycoprotein iib/iiia inhibitors, tirofiban, heparin, warfarin, thrombolytics: streptokinase, urokinase, anistreplase, rtpa, reteplase, tenecteplase.

Reference books

- The Interventional Cardiac Catheterization Handbook, 3rd Edition By Morton J. Kern
- Invasive Cardiology**, 3rd Edition by Sandy Watson**

COMMUNITY ORIENTATION & CLINICAL VISIT (INCLUDING RELATED PRACTICAL'S TO THE PARENT COURSE) PRACTICAL

Subject Code: **BCCTS1-504** **L T P C** **Duration: 120 (Hrs.)**
0 0 8 4

Students will gain additional skills in medical equipment and radiation safety techniques. Students apply knowledge from previous clinical learning experience under the supervision of a senior technologist.

Students are tested on intermediate technical skills.

BASICS OF CLINICAL SKILL LEARNING

Subject Code: BCCTS1-507 **L T P C** **Duration: 45 (Hrs.)**
3 0 0 3

Course Objective:

- To Understand the basic ideas on how to check for Vital Signs of the Patient
- This course the Student will learn how to handle the patients and their positioning
- They will also learn on the Basics of Nasal-Gastric Tube
- The Students will learn on Administration of IV, IV and Medication
- Also they will know about Cleanliness in the Asepsis

Course Outcomes:

- After successful accomplishment of the course, the students would be able to Measure Vital Signs, do basic physical Examination of the patients, NG tube basics, Administration of Medicines
- The students will learn about Asepsis, and the Cleanliness related to asepsis and on mobility of the patients

Unit 1 **(15 hrs.)**

- **Measuring vital signs:** temperature: axillaries temperature, pulse: sites of pulse, measurement, respiratory, blood pressure, pain: pain scale
- **Physical examination:** observation, auscultation(chest), palpation, percussion, history taking

Unit 2 **(10 hrs.)**

- **Feeding: enteral feeding, ng tube:** measurement, procedure, care, and removal of nasal-gastric tube, nasal-gastric tube feeding, and parenteral nutrition.

Unit 3 **(10 hrs.)**

- **Administrations:** oral, intravenous, intramuscular, subcutaneous, recapping of syringe, loading of drugs, calculation of drugs, venipuncture, iv infusion, cannula, attachment of iv infusion set, fluid collection, heparin lock, maintenance of iv set, performing nebulizer therapy, inhaler, oxygen therapy (nasal, prongs, nasal catheter, venturi mask, face mask).

Unit 4 **(10 hrs.)**

- **Asepsis:** hand wash techniques,(medical, surgical) universal precaution, protecting equipments: using sterile gloves, opening a sterile package and establishing a sterile field, sterile dressing changes, surgical attire, wound dressing, suture removal, cleaning and application of sterile dressing, wearing and removal of personal protective equipment.
- **Mobility and support:** moving and positioning, range of motion exercises (active & passive) assisting for transfer, application of restraints.

Reference Book:

- Jansen van Vuuren, M. V. (2005). A framework for a skills laboratory curriculum in an undergraduate medical programme in South Africa (Doctoral dissertation, University of the

Free State).

HOSPITAL OPERATION MANAGEMENT

Subject Code: BCCTS1-508 **L T P C** **Duration: 45 (Hrs.)**
3 0 0 3

Course Objective:

- To promote scientific management of hospitals and advancement of health care systems so as to make it rational, responsive and cost efficient.
- To promote the development of high quality hospital care in the community and the country.
- It has to provide a satisfactory environment to the patient and also to the doctors for clinical research.

Course Outcomes:

- Understand and apply resource management concepts (personnel, finance, and material resources) and the processes and strategies needed in specific hospital sectors.
- Communicate effectively and develop their leadership and teambuilding abilities.
- Apply modern change management and innovation management concepts to optimize structures.
- Analyze existing hospital service policies and enhance their alignment within the local and national context

Unit 1 **(15 hrs.)**

- **Medico-legal cases:** introduction, laws associated with medico-legal cases, three core contents in medico-legal cases w.r.t doctors, patient & profession,
- **Considerations of ethics:** consent, confidentiality, mental health, end of life and organ transportation, research & clinical trials

Unit 2 **(10 hrs.)**

- **Hospital information system (his):** hospital information system management, software applications in registration, billing, investigations, reporting, medical records management, security and ethical challenges.

Unit 3 **(10 hrs.)**

- **Equipment operations management:** hospital equipment repair and maintenance, types of maintenance, job orders, equipment maintenance log books, amcs.

Unit 4 **(10 hrs.)**

- **Role of medical records in health care management:** computers for medical records, developments of computerized medical record information processing system(emr's), computer stored (vs) manual hand written record, advantages of emr (vs) manual

Reference Book

- Hospital Operations: Principles of High Efficiency Health Care William S. Lovejoy
Handbook of Healthcare Operations Management Brian T. Denton

6th Semester

CARDIAC CATHETERIZATION

Subject Code: BCCTS1-601 | **L T P C** | **Duration: 30 (Hrs.)**
2 0 0 2

Course Objective:

- To provide the critical information to students when beginning with interventional cardiology.
- To provide an extension of techniques and methods described for diagnostic catheterization and specially related techniques.

Course Outcomes:

- The students will gain knowledge about chances of a successful procedure.
- To enable students, understand about benefit/risk to the patient if the procedure is successful/ unsuccessful
- The occurrence and management of various complications.

Unit 1 **(10 hrs.)**

- Asepsis in the cardiovascular catheterization laboratory
- Diagnostic catheterization

Unit 2 **(10 hrs.)**

- **Atherectomy and thrombectomy:** atherectomy devices- directional coronary atherectomy, rotational atherectomy, components, procedure, complications, thrombectomy devices- angiojet, manual aspiration devices
- **Renal artery intervention**

Unit 3 **(05 hrs.)**

- **Foreign body retrieval:** various instruments- amplatz goose neck snare, curry
- Intravascular retriever, dotter intravascular retriever, vascular retrieval forceps, welter retrieval loop, biopsy forceps

Unit 4 **(05 hrs.)**

- **Emergencies in the cardiac catheterization laboratory:** complications encountered in ccl, acls and bls algorithm

Reference books or related websites:

- The Interventional Cardiac Catheterization Handbook, 3rd Edition By Morton J. Kern

CARDIAC CATHETERIZATION PRACTICAL

Subject Code: BCCTS1-604 | **L T P C** | **Duration: 60 (Hrs.)**
0 0 4 2

Course Objective:

- To provide the critical information to students when beginning with interventional cardiology.
- To provide an extension of techniques and methods described for diagnostic catheterization and specially related techniques.

Course Outcomes:

- The students will gain knowledge about chances of a successful procedure.
- To enable students, understand about benefit/risk to the patient if the procedure is successful/ unsuccessful
- The occurrence and management of various complications.

Experiments

1. Sterilization techniques
2. Hardwares used in Cardiac Catheterization
3. Procedures involved in Cardiac Catheterization

Reference books

- The Interventional Cardiac Catheterization Handbook, 3rd Edition By Morton J. Kern

PEDIATRIC INTERVENTIONS

Subject Code: BCCTS1-602 **L T P C** **Duration: 30 (Hrs.)**
2 0 0 2

Course Objective:

- To provide the critical information to students when beginning with Pediatric cardiology interventions.
- To approach the diagnostic problem presented by an infant or child with a cardiac finding.

Course Outcomes:

- The students will gain knowledge through proper assessment and integration of the history, physical examination, electrocardiogram, and chest X-ray, the type of problem can be diagnosed correctly in many patients, and the severity and hemodynamics correctly estimated.
- The occurrence and management of various complications in Pediatric cardiology interventions.

Unit 1 **(10 hrs.)**

- **Tools to diagnose cardiac conditions in children:** history- general principles of the cardiovascular history, chief complaint and/or presenting sign, physical examination-vital signs, cardiac examination, laboratory examinations

Unit 2 **(05 hrs.)**

- **Cardiac defect closure device:** device closure procedures in patent foramen ovale (pfo), atrial septal defect (asd), ventricular septal defect (vsd), patent ductus arteriosus (pda), left atrial appendage (laa).

Unit 3 **(10 hrs.)**

- **Percutaneous valve commissurotomy, repair, and replacement:** cardiac valves from the left to the right: mitral, aortic, pulmonic & tricuspid valves, their pathologies: ms, mr, as, ps, ts and treatment.
- **Pediatric interventional cardiology:** introduction, general anesthesia versus sedation and analgesia, diagnostic procedures, interventional procedures, device placement.

Unit 4 **(05 hrs.)**

- Chamber localization & cardiac malposition
- Recent advances in pediatric interventions

Reference books

- Invasive Cardiology, 3rd Edition by Sandy Watson.
- Pediatric Cardiology the Essential Pocket Guide, 3rd Edition by Walter H. Johnson, Jr., MD
- The Interventional Cardiac Catheterization Handbook, 3rd Edition By Morton J. Kern

PEDIATRIC INTERVENTIONS PRACTICAL

Subject Code: BCCTS1-605 | **L T P C** | **Duration: 60 (Hrs.)**
0 0 4 2

Course Objective:

- To provide the critical information to students when beginning with Pediatric cardiology interventions.
- To approach the diagnostic problem presented by an infant or child with a cardiac finding.

Course Outcomes:

- The students will gain knowledge through proper assessment and integration of the history, physical examination, electrocardiogram, and chest X-ray, the type of problem can be diagnosed correctly in many patients, and the severity and hemodynamics correctly estimated.
- The occurrence and management of various complications in Pediatric cardiology interventions

Experiments

1. Diagnosis of Cardiac conditions in children
2. Cardiac Defect Closure Devices
3. Valve repair and replacement procedures
4. Drugs used in Pediatric Interventions

Reference books

- Invasive Cardiology, 3rd Edition by Sandy Watson.
- Pediatric Cardiology the Essential Pocket Guide, 3rd Edition by Walter H. Johnson, Jr., MD
- The Interventional Cardiac Catheterization Handbook, 3rd Edition By Morton J. Kern

CCT DIRECTED CLINICAL EDUCATION – IV

Subject Code: BCCTS1-603 **Duration: 240 (Hrs.)**

Students will gain additional skills in diagnosis in pediatric cases and pediatric interventional procedures. Students apply knowledge from previous clinical learning experience under the supervision of a senior technologist. Students are tested on intermediate clinical diagnostic and therapeutic skills. (Total – 450 hrs).

INTERNSHIP

Guidelines:

- The internship shall commence after the student has completed and passed all subjects up to VI semesters.
- The internship is compulsory.
- The duration of the internship shall be one year.
- The degree of Bachelor in Allied Health Sciences shall be awarded after the satisfactory completion of the internship.

Evaluation of Internees:

Formative Evaluation:

Day to day assessment of the internees during their internship postings should be done by the Head of the Department/Faculty assigned. The objective is that all the interns must acquire necessary minimum skills required for carrying out day to day professional work competently. This can be achieved by maintaining Records /Log Book by all internees. This will not only provide demonstrable evidence of the processes of training but more importantly of the internee's own acquisition of competence as related to performance.

Summative Evaluation:

It shall be based on the observation of the Sr. Technical staff / Faculty of the department concerned and Record / Log book maintained by the interns. Based on these two evaluations, the Head of the Department shall issue a certificate of satisfactory completion of training, following which the university shall award the degree or declare him/her eligible for it.

To implement the project work uniformly for all the specialties in view of the curriculum and training to be acceptable internationally and the students to get opportunity for higher studies and employment.

Internship Programme:

05 days for orientation programme 300 days in Cardiology Department 30 days in Cardiac ICU/General ICUs 15 days for Record Keeping/CSSD department 15 days for Casualty/Visit to other hospitals

Students will begin to develop critical thinking abilities utilizing the allied health personnel roles of communicator and caregiver. Students will learn principles of professional allied health personnel practice and provide direct care to individuals within a medical surgical setting while recognizing the diverse uniqueness of individuals with health alterations.

I Clinical Teaching: Demonstrate beginning competency in technical skills.

II. Independent Work by Student guided by faculty

a. Develop effective communication skills (verbally and through charting) with patients, team members, and family

b. Identify relevant data for communication in pre and post conferences

c. Identify intra and inter-professional team member roles and scopes of practice. Establish appropriate relationships with team members.

c. Identify intra and inter-professional team member roles and scopes of practice. Establish appropriate relationships with team members.

d. Identify the need for help when appropriate to the situation. Delegates level specific skills to Appropriate team members.

III. Hands on practical work by students

a. Navigate and document clear and concise responses to care in the electronic health record for patient, where appropriate for clinical setting

b. Protect confidentiality of electronic health records data, information, and knowledge of technology in an ethical manner

IV. Independent work by student

a. Maintain a positive attitude and interact with interprofessional team members,

Faculty, and fellow students in a positive, professional manner. Accept constructive feedback and develop a plan of action for improvement.

b. Demonstrate expected behaviors and complete tasks in a timely manner. Arrive at Clinical experiences at assigned times. Maintain professional behavior and

appearance.

c. Accept individual responsibility and accountability for nursing interventions,

outcomes, and other actions. Engage in self-evaluation & assume responsibility for Learning.

***Clinical evaluation tool guidelines for full descriptions of grades 1-4.**

4-exceeds expectations (range of marks –40-50 marks) 3-meets expectations (range of marks –30-40 marks) 2-below expectations (range of marks –25-30 marks) 1-does not meet expectations (range of marks –no marks)