

SYLLABUS

**for Courses affiliated to the
Kerala University of Health Sciences**

Thrissur-680596



**BACHELOR OF
CARDIO VASCULAR TECHNOLOGY
Course Code: 016
(2016-17 Academic year onwards)**

2016

2.COURSE CONTENT

2.1 Title of course:

Bachelor Degree in Cardio Vascular Technology (BCVT)

2.2 Objectives of course

To train the student to assist *the* cardiologist in invasive or non-invasive cardiac laboratory, in performing routine cardiac investigations and interventional procedures.

Scope: After successful completion of the course, the person can be allowed to perform non-invasive procedures like echocardiography, treadmill and Holter testing under supervision of cardiologist and assist the cardiologist in cardiac catheterization laboratory

2.3 Medium of instruction:

The medium of instruction for the course shall be English.

2.4 Course outline

Admissions up to 2013-14.

Sl. No	Name of Subject	University theory		Total		University Practical		Viva Voce	Total (University theory+Viva Voce+Practical)	
		Min	Max	Min	Max	Min	Max		Min	Max
1	Paper 1 - Basic Sciences	50	100	50	100				50	100
2	Paper 2 – ECG, Echo, Holter	50	100	50	100				50	100
3	Paper 3 – Cardiac Catheterisation and Cath lab	50	100	50	100				50	100

	University Practical/Viva Voce					40	80	20	50	100
	Total									400

Admissions from 2014-15 onwards

1st Year

Sl. No	Name of Subject	University theory		Total		University Practical		Viva Voce	Total (University theory+Viva Voce+Practical)	
		Min	Max	Min	Max	Min	Max		Min	Max
1	Paper 1 - Basic Sciences	50	100	50	100				50	100
	Total									100

2nd Year

Sl. No	Name of Subject	University theory		Total		University Practical		Viva Voce	Total (University theory+Viva Voce+Practical)	
		Min	Max	Min	Max	Min	Max		Min	Max
1	Paper 2 – ECG, Echo, Holter	50	100	50	100				50	100
	Total									100

3rd Year

Sl. No	Name of Subject	University theory		Total		University Practical		Viva Voce	Total (University theory+Viva Voce+Practical)	
		Min	Max	Min	Max	Min	Max		Min	Max
1	Paper 3 – Cardiac Catheterisation and	50	100	50	100				50	100
	University Practical/Viva Voce					40	80	20	50	100
	Total									200

2.5 Duration

Three years plus one year of compulsory rotating internship.

2.6 Subjects

As given under clause “Content of each subject in each year “

2.7 Total number of hours

The students have to attend a minimum of 240 working day.

1st year

- Lab Posting -720 hours(3hrs/day * 240 days)
- Eco Cardiography-4 month

- ECG-Stream-Holter-4 months
- Catlab-4 month

Basic Science:720 hours

- Anatomy: -124 hours(Lecture:62hrs,Tutorial/Seminar:62hrs)
- Physiology:-124hrs(Lecture:62hrs,Tutorial/Seminar:62hrs)
- Pathology & Pathophysiology- 124hrs(
Lecture:62hrs,Tutorial/Seminar:62hrs)
- Microbiology - 124hrs(Lecture:62hrs,Tutorial/Seminar:62hrs)
- Pharmacology & Therapeutic - 124hrs(
Lecture:62hrs,Tutorial/Seminar:62hrs)

2nd year Lab posting- 720 years

- Eco Cardiography-4 month
- ECG-Stream-Holter-2 months
- Catlab-6month
- ECG – 185hrs(Lecture/Tutorial/Seminar)
- Extra ECG-185hrs(Lecture/Tutorial/Seminar)
- Echo-288hrs(Lecture/Tutorial/Seminar)
- Holter-72hrs (Lecture/Tutorial/Seminar)

3rd year

- Cardio Catherisation-Introductory Course- 240hrs(Lecture/Tutorial/Seminar)
- Cardio Catherisation – Paper II- 240hrs (Lecture/Tutorial/Seminar)
- Cardio Catherisation – Paper III(Pacing & Electrophysiology)- 240hrs
(Lecture/Tutorial/Seminar)

Lab Posting -720hrs

- Eco -2 month
- ECG-Stream-Holter-4 months
- Catlab-6 month

2.8 Branches if any with definition

Not applicable.

2.9 Teaching learning methods

Lecture and Practical class.

2.10 Content of each subject in each year

Year	Subject	
1	Anatomy	General introduction to anatomy
	gross Human Anatomy	Organ systems in the body with various parts
	Anatomy of Cardio	Anatomy of Heart:
	Vascular system	<ul style="list-style-type: none"> • Surface Anatomy • Gross anatomy, cardiac chambers, septa, valves • Pericardium Arteries, Veins, Lymphatics <ul style="list-style-type: none"> • Aorta and branches • Venous drainage

	Physiology	<ul style="list-style-type: none"> • Normal Cradiac Cycle • Pulse • Heart rate • Blood pleasure • Cardiac output • Heart Sounds, Murmurs • Measurement of Blood Pressure:Technique: Sphygmomanometer • ECG and Cardiac Cycle • Chambers: Pressure and wave forms • Arterial, Venous Pressure and Wave forms • Oxygen Saturations: Physiology ofOxygen Transport • Blood Gases – Technique and Various parameters • Flow, pressure and resistance • Cardiac Cycle, circulation, Tissue Perfusion– Unified concept
	Pathology and Pathophysiology	<ul style="list-style-type: none"> • Coronary artery disease and myocardial infraction • Rheumatic Fever • Valvular Heart Disease • Mitral stenosis • Mitral regulation • Aortic stenosis • Aortic regulation • Tricuspid value disease • Combined value diseases • Pericardial, Myocardial Disease including End

		<p>myocardial Disease</p> <ul style="list-style-type: none"> • Hypertension • Pulmonary Hypertension • Congenital Heart Disease: • A cyanotic • Cyanotic • Shunts • Left to Right Shunts
--	--	---

	Microbiology	<ul style="list-style-type: none"> • Common micro organisms • Sepsis • Aseptic precautions
	Pharmacology and Therapeutics	<ul style="list-style-type: none"> • Modes/ routes of Drug Administration (Rationale) • Intra Venous Fluids: Crystalloids, Colloids • Common Cardiac Drugs – Part – 1: Digoxin, Diuretics, Vasodilators, Nitrates • Common Cardiac Drugs – Part – II: Beta Blockers, Calcium Blockers, ACE inhibitor • Common Cardiac Drugs – Part – III: Antiarrhythmic drugs, positive inotropic drugs • Drug for Cardiac Resuscitation
II	Electrocardiography	<ul style="list-style-type: none"> • Basic and Principle • Electrode/ Lead Placements • Normal ECG: Wave Form • Normal ECG: Intervals • ECG Machined: Functions, Frequency Response, Recording Speed, Sensitivity, Standardisation, Stylus Lag(Heat Stylus)
		<p>Ischemia</p> <ul style="list-style-type: none"> • ECG in Miscellaneous Conditions: Metabolic, electrolyte changes

	Exercise ECG	<ul style="list-style-type: none"> • Equipments/ Types of Exercise ECG • Indication / Contradiction • Lead placement – Rationale, Limitation • Monitoring during Ex. ECG: Clinical/ECG/Parameters • Exercise ECG Protocol: Indications/ Advantage and Disadvantage • Exercise Physiology • Exercise ECG: Preparation of Patient / Equipment/ Defibrillators, Emergency Drugs
	Echocardiography	<ul style="list-style-type: none"> • Principle of Echocardiography • Transducers • Anatomical Planes for viewing in Echocardiography • Normal M-Mode Echo Study: Anatomy/ Function: Measurements. • Echo for Cardiac Function – systolic and diastolic • Echo in Heart Disease: Acquired • Echo in Heart Disease: Congenital
		<p>Disposables Archiving Record Keeping Stock-Indents, Stock Maintenance, Stock Verification</p>
		<p>Principle of Doppler Measurement of Flows and Gradients</p> <ul style="list-style-type: none"> • Assessment of gradients, shunts, valve areas,

		<ul style="list-style-type: none"> • Assessment of valve regurgitations <p>Utility of Doppler in Assessment of Cardiac Disease</p> <ul style="list-style-type: none"> • Tissue Doppler <p>Stress Echocardiography: Protocols, 2D Echo Views, Analysis</p> <p>Trans - esophageal Echo</p> <ul style="list-style-type: none"> ● Indication/Contraindication ● Patient Preparation ● Transducer: Maintenance, Sterilization, Handling etc. ● Monitoring ● Emergency Drugs ● Utility <p>8. Intra Vascular Ultrasound, Intracoronary Doppler Wire</p>
	Holter Recording	<ul style="list-style-type: none"> • Principles of Holter • Utility and indications • Analysis of Holter
III Year	<ul style="list-style-type: none"> • Cardiac Catheterization Part I – Introductory Course 	<ul style="list-style-type: none"> • Cardiac Catheterisation: Laboratory Setup / Types Procedures • Sterile Techniques in Cath Lab / Sterile Areas, Sterile Procedure, Sterile trolley setting, Scrubbing, gowns and Gloves, scrubbing and draping patients, handling sterile disposables etc. • Sterilisation and re-use of hardware • Equipments: Cath-Lab Equipments • * Defibrillator / Pacemaker / IABP/ BOYLE's Apparatus / Suction Machine/ Oxygen • * Infusion Pumps / Programmed Stimulators, Pacing System Analysers • Equipments in Cath-Lab • * Hemodynamic Recorders • *Transducers • *Recording of Pressure Wave Form • Range/ Gain/ Speed/ Systolic/ Diastolic and Mean Pressures in Chambers and Vesseles • Hazard Management • * Radiation Protection • * Infection Prevention • * Injury Prevention: Electrical/ Mechanical • Wastes Management

		<ul style="list-style-type: none"> • * Plastics • * Biological Wastes • * Glass/ Needle/ Syringes • Technician's Role • * Patient Monitoring • * Procedure Related: Data Collection • * Acquisition and entry of Data, Procedure Books, Log Books, Registers etc. • * Stock of all disposables Eg. Catheters etc. • * Stores (Disposable Items) • * Accounting (Used Items)
	<p>Cardiac Catheterization – Part -II</p>	<ul style="list-style-type: none"> • Cardiac Catheterisation Procedure: Diagnostic Studies • Cardiac Catheterisation Procedures: Therapeutic/ Interventional Procedures • 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 • Cardiac Catheterisation • Hardware: Catheters/ Connections/ Sheaths/ Stopcocks/ Wires/ Angioplasty Catheters • Complication of Cardiac Catheterisation: Recognition and management • Cardiopulmonary Resuscitation • Special Procedures: • * Pericardial Tap

		<p>Mainfolds, 3-way Stock Cocks etc</p> <ul style="list-style-type: none"> • Guide Wires and Dilators • Puncture Needles (Vascular Access Needles) • Woven Darcon Cathetes: GL, NIH, Lehman, Woven, Dacron Electrode Catheters • Flow Directed Catheters(Swan Ganz Type) Balloon Angio Catheters • Polyurethane Catheters: Pig Tail, Judkins, Coronary, Amplatz Coronary, Brachial Coronary, Sones Catheters • Guide Wires: Short, Normal Lenth, Exchange Length 'J' Tipped Movable Core, Tips, Deflectable Types
	<p>Cardiac Catheterisation Part III Pacing and Electrophysiology</p>	<ul style="list-style-type: none"> • Arrhythmias: Brady and Tachy Arrhythmias • Indication for Temporary / Permanent Pacing Technique: Temporary Pacing • Permanent Pacing: VVI AAI Pacing(Single Chamber Pacing) • Permanent Pacing: DDD, other Modes of Pacing • Pacemaker Clinic: Management of Pacemaker Patients, Programmers
		<ul style="list-style-type: none"> • Cardiac Arrest • Cardio Respirator Resuscitation • Hypotension/ Hypertensive Crisis • Cardiac Tamponade • Anaphylaxis • Emergency Drugs

2.11 No: of hours per subject

As given under clause “Total number of hours “

2.12 Practical training

As given under clause “Content of each subject in each year “

2.13 Records

To be maintained for all Practical Work.

2.14 Dissertation:

Not Applicable

2.15 Speciality training if any

Three months training in reputed institution 14(a).

2.16 Project work to be done if any

Not Applicable

2.17 Any other requirements [CME, Paper Publishing etc.]

Not Applicable

2.18 Prescribed/recommended textbooks for each subject

As suggested by the concerned faculty/HOD

2.19 Reference books

As suggested by the concerned faculty/HOD.

2.20 Journals

As suggested by the concerned faculty/HOD.

2.21 Logbook

To be maintained for all academic work and shall be countersigned by the concerned HOD.

3. EXAMINATIONS

3.1 Eligibility to appear for exams

- A student who has secured 50%marks for internal assessment in theory and practical separately is qualified to appear for University examination provided he/she satisfies that 80% attendance each in theory and practical separately.
- Submit records (log book), duly certified every week by the faculty in charge.
- Progress evaluated continuously through internal assessment
- Certificate of satisfactory completion of the course by the Head of department

Eligibility criteria for appearing for the final examination:

- Attendance – Minimum 80% in each theory and practical's separately
- Completed records in the subjects duly approved by the faculty concerned
- Should have obtained minimum of 50% marks in the internal assessment
- Should produce certificate of satisfactory completion of course from the Head of the Department conducting the course.

3.2 Schedule of Regular/Supplementary exams

There will be two examinations in a year (regular and supplementary), to be conducted as per notification issued by university from time to time.

First, second, and third year Examinations of the BCVT course shall be held at the end of first year, second year, and third year respectively. Supplementary examination shall be conducted by the university for the benefit of unsuccessful candidates. The supplementary examination shall be conducted within six months from the date of announcement of results.

The particulars of the subjects for various examinations and distributions of marks are shown separately in the scheme of examination.

3.3 Scheme of examination showing maximum marks and minimum marks

1st Year

Sl. No	Name of Subject	University theory		Total		University Practical		Viva Voce	Total (University theory+Viva Voce+Practical)	
		Min	Max	Min	Max	Min	Max		Min	Max
1	Paper 1 - Basic Sciences	50	100	50	100				50	100
	Total									100

2nd Year

Sl. No	Name of Subject	University theory		Total		University Practical		Viva Voce	Total (University theory+Viva Voce+Practical)	
		Min	Max	Min	Max	Min	Max		Min	Max
1	Paper 2 – ECG, Echo, Holter	50	100	50	100				50	100
	Total									100

3rd Year

Sl. No	Name of Subject	University theory		Total		University Practical		Viva Voce	Total (University theory+Viva Voce+Practical)	
		Min	Max	Min	Max	Min	Max		Min	Max
1	Paper 3 – Cardiac Catheterisation and Cath lab	50	100	50	100				50	100
	University Practical/Viva Voce					40	80	20	50	100
	Total									200

3.4 Papers in each year

As given under clause "Scheme of examination showing Maximum or minimum Marks "

3.5 Details of theory exams

As given under clause: 3.3 "No. of hours per subject "

3.6 Model question paper for each subject with question paper pattern

The examination will comprise of written examination, practical and viva voce

Basic Sciences

Time: 3hrs

Maximum marks: 100

- *Answer all questions*
- *Draw diagrams wherever necessary*

Essay (20)

1. Explain in detail the normal cardiac cycle.

Short notes(10x8=80)

2. Dobutamine
3. Blood culture
4. Sterilization techniques
5. Universal aseptic precautions
6. Boyles apparatus
7. Noninvasive BP measurement
8. Placement of ECG leads- routine
9. Femoral artery pressure tracing
10. Anatomy of coronary sinus
11. Coronary circulation

Applied Sciences – ECG, ECHO, HOLTER

Time: 3hrs

Maximum marks: 100

- *Answer all questions*
- *Draw diagrams wherever necessary*

Essay (20)

1. Write down briefly the echocardiographic features of mitral stenosis .Draw the pressure trace of severe mitral stenosis. Describe noninvasive management of mitral stenosis.

Short notes (10x8=80)

2. Tread mill test
3. Mitral valve M - mode in echo
4. Pulmonary artery hypertension
5. Atrial fibrillation
6. Dukes score
7. Indications of Holter monitoring
8. Continuity equation and its applications in echo lab
9. Colour Doppler echocardiography
10. Normal ECG
11. Stress echocardiography

Cardiac Catheterization & Cathlab Procedures

Time: 3hrs

Maximum marks: 100

- *Answer all questions*
- *Draw diagrams wherever necessary*

Essay (20)

1. Coronary angiography techniques, views, clinical usefulness. Briefly describe on the contrast media used in cathlab.

Short notes (10x8=80)

2. Radiation hazards
3. Holter monitoring
4. PTCA
5. Balloon mitral valvotomy
6. Permanent pacemaker
7. Echocardiography in mitral stenosis
8. Coronary guide wire
9. Fractional flow reserve
10. Cardiopulmonary resuscitation
11. IABP

3.7 Internal assessment component

Scheme of assessing the progress during the course of study. Calculation of internal assessment is done by conducting written tests by the Cardiology Department. 50% marks of the total marks fixed for internal assessment in a particular subject in order to be eligible to appear in the final University examination of that subject. Internal Assessment should be a continuous evaluation.

The class average of internal assessment marks should not cross 75% (regular examination) or 80% (supplementary examination) both in theory and practical examination.

3.8 Details of practical/clinical practicum

As given under clause "Scheme of examination showing maximum or minimum marks "& "Model question paper "

3.9 Number of examiners needed (Internal & External) and their qualifications

Examiners

Qualification – Minimum DM or DNB Cardiology with at least 5years experience.

Number of examiners – 2 - One internal and one external. To become external/internal examiner a teacher should possess a minimum of five years of post P.G teaching experience in the concerned subject.

3.10 Details of viva:

As given under clause “Scheme of examination showing maximum or minimum marks”

4. INTERNSHIP

4.1 Eligibility for internship

Students will be eligible to do internship only after passing all the theory papers and practicum.

4.2 Details of internship Training

One year, after successful completion and passing of the course. Before internship the students should be registered with Kerala Paramedical Council. The internship will consist of compulsory rotating practical training in the various subjects duly certified by the Head of department. Maximum no. of leave will be 20 for the whole period. 1 day weekly off may be additionally permitted. No holidays. Sick leave may be permitted by the head of institution on production of bona fide medical certificate. Stipend as fixed by the Govt. will be paid during internship

During training period

Posting station	First year	Second year	Third year
Echocardiography	4 months	4 months	4 months
ECG, Stress Testing, Holter	4 months	2 months	2 months
Catheterization laboratory	4 months	6 months	4 months

4.3 Model of Internship Mark lists

Internship Completion Certificate: issued from the concerned Institution.

4.4 Extension rules

Extension internship: Internship shall be extended by the number of days the students remain absent. These extended days of internship should be completed in the respective external/internal Institution. Any other leave other than eligible leave has to be compensated by extension granted by Principal.

4.5 Details of Training given

Every candidate admitted BCVT degree course shall undergo 180 days of compulsory rotatory internship after passing of the final year examinations. No candidate shall be awarded degree certificate without successfully completing six months of internship.

5. ANNEXURES

5.1 Check Lists for Monitoring: Log Book, Seminar Assessment etc. to be formulated by the curriculum committee of the concerned Institution