



AMRITA

VISHWA VIDYAPEETHAM

A Multi Campus University with 'A' Grade Accreditation by NAAC

AMRITA SCHOOL OF MEDICINE

Amrita Centre for Allied Health Sciences

AIMS Ponekkara PO, Kochi – 682 041
Tel: 0484 – 2858131, 2858375, 2858845
Fax: 0484-2858382
Email: ahs@aims.amrita.edu
Web: www.amrita.edu

PROGRAM

MSc Cardio Vascular Technology

(Revised with effect from 2017-2018 onwards)



A Super Specialty Tertiary Care Hospital Accredited by ISO 9001-2008, NABL & NABH

Our Chancellor



SPIRITUAL PRINCIPLES IN EDUCATION

“In the gurukulas of ancient rishis, when the master spoke it was love that spoke; and at the receiving end disciple absorbed of nothing but love. Because of their love for their Master, the disciples’ hearts were like a fertile field, ready to receive the knowledge imparted by the Master. Love given and love received. Love made them open to each other. True giving and receiving take place where love is present. Real listening and ‘sraddha’ is possible only where there is love, otherwise the listener will be closed. If you are closed you will be easily dominated by anger and resentment, and nothing can enter into you”.

“Satguru Mata Amritanandamayi Devi”

Introducing AIMS

India is the second most populous nation on earth. This means that India's health problems are the world's health problems. And by the numbers, these problems are staggering 41 million cases of diabetes, nearly half the world's blind population, and 60% of the world's incidences of heart disease. But behind the numbers are human beings, and we believe that every human being has a right to high-quality healthcare.

Since opening its doors in 1998, AIMS, our 1,300 bed tertiary care hospital in Kochi, Kerala, has provided more than 4 billion rupees worth of charitable medical care; more than 3 million patients received completely free treatment. AIMS offers sophisticated and compassionate care in a serene and beautiful atmosphere, and is recognized as one of the premier hospitals in South Asia. Our commitment to serving the poor has attracted a dedicated team of highly qualified medical professionals from around the world.

The Amrita Institute of Medical Sciences is the adjunct to the term "New Universalism" coined by the World Health Organization. This massive healthcare infrastructure with over 3,330,000 sq. ft. of built-up area spread over 125 acres of land, supports a daily patient volume of about 3000 outpatients with 95 percent inpatient occupancy. Annual patient turnover touches an incredible figure of almost 800,000 outpatients and nearly 50,000 inpatients. There are 12 super specialty departments, 45 other departments, 4500 support staff and 670 faculty members.

With extensive facilities comprising 25 modern operating theatres, 210 equipped intensive-care beds, a fully computerized and networked Hospital Information System (HIS), a fully digital radiology department, 17 NABL accredited clinical laboratories and a 24/7 telemedicine service, AIMS offers a total and comprehensive healthcare solution comparable to the best hospitals in the world. The AIMS team comprises physicians, surgeons and other healthcare professionals of the highest caliber and experience.

AIMS features one of the most advanced hospital computer networks in India. The network supports more than 2000 computers and has computerized nearly every aspect of patient care including all patient information, lab testing and radiological imaging. A PET (Positron Emitting Tomography) CT scanner, the first of its kind in the state of Kerala and which is extremely useful for early detection of cancer, has been installed in AIMS and was inaugurated in July 2009 by Dr. A. P. J. Abdul Kalam, former President of India. The most recent addition is a 3 Tesla Silent MRI.

The educational institutions of Amrita Vishwa Vidya Peetham, has at its Health Sciences Campus in Kochi, the Amrita School of Medicine, the Amrita Centre for Nanosciences, the Amrita School of Dentistry, the Amrita College of Nursing, and the Amrita School of Pharmacy, committed to being centres of excellence providing value-based medical education, where the highest human qualities of compassion, dedication, purity and service are instilled in the youth. Amrita School of Ayurveda is located at Amritapuri, in the district of Kollam. Amrita University strives to help all students attain the competence and character to humbly serve humanity in accordance with the highest principles and standards of the healthcare profession.

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Part I

Rules and Regulations

I. Post Graduate Programmes (Master of Sciences)

1. Details of Post Graduate Courses :			
Sl. No.	Course	Duration	Eligibility for admission to the course
1	Medical Laboratory Technology (MLT)	2 years	Pass in B.Sc MLT (4 year regular courses only)
2	Neuro-Electro Physiology		B.Sc Neuro-Electro Physiology
3	Swallowing Disorders and Therapy		BASLP
4	Clinical Research		MBBS,BDS/BAMS/BHMS/B.Pharm/B.Sc Allied Health Sciences/B.Sc Biotechnology/B.Sc Nursing/B.Sc in any Life Sciences
5	Biostatistics		Graduates in Statistics/Mathematics with paper in Statistics
6	Respiratory Therapy		B.Sc Respiratory Therapy
7	M.Sc Diabetes Sciences		B.Sc Diabetes Sciences
8	M.Sc Cardiovascular Technology		B.Sc Cardiovascular Technology
9	M.Sc Trauma and Critical Care		B.Sc Emergency Medical Technology, B.Sc Respiratory Therapy, B.Sc Physician Assistant, B.Sc Anaesthesia Technology
10	M.Sc Physician Assistant – Medical Oncology		B.Sc Physician Assistant
11	M.Sc Dialysis Therapy		B.Sc Dialysis Therapy

I.2. Medium of Instruction:

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

II.3. Eligibility:

Essential qualifications for eligibility are mentioned under clause No. I.

II. General Rules:

Admissions to the courses will be governed by the conditions laid down by the University from time to time and as published in the Regulations for admissions each year.

I.1. Duration of the Course

Duration details are mentioned under clause No.I of this booklet.

Duration of the course	: Mentioned under clause No. I
Weeks available per year	: 52 weeks
Vacation / holidays	: 5 weeks (2 weeks vacation + 3 weeks calendar holidays)
Examination (including preparatory)	: 6 weeks
Extracurricular activities	: 2 weeks
Weeks available	: 39 weeks
Hours per week	: 40 hours
Hours available per academic year	: 1560 (39 weeks x 40 hours)

Internship wherever specified are integral part of the course and needs to be done in Amrita Institute of Medical Sciences, Centre for Allied Health Sciences, Kochi itself.

II.2. Discontinuation of studies

Rules for discontinuation of studies during the course period will be those decided by the Chairman / Admissions, and is published in the "Terms and Conditions" every year.

II.3. Educational Methodology

Learning occurs by attending didactic lectures, as part of regular work, from co-workers and senior faculty, through training offered in the workplace, through reading or other forms of self-study, using materials available through work, using materials obtained through a professional association or union, using materials obtained on students own initiative, during working hours at no cost to the student.

II.4. Academic Calendar

Annual Scheme

FIRST YEAR

Commencement of classes	– August
Sessional exam	– March
University exam (with practical)	– 15 June - 15 July

SECOND YEAR

Commencement of classes	– August
Sessional exam	– March
University exam (with practical)	– 15 June - 15 July

III. Examination Regulations:

III.1. Attendance: 80% of attendance (physical presence) is mandatory.

Medical leave or other types of sanctioned leaves will not be counted as physical presence. Attendance will be counted from the date of commencement of the session to the last day of the final examination in each subject.

III.2. Internal Assessment:

1. Regular periodic assessment shall be conducted throughout the course. At least one sessional examination in theory and preferably one practical examination should be conducted in each subject. The model examination should be of the same pattern of the University Examination. The marks obtained in assignments / oral / viva / practical shall be taken to calculate the internal assessment.
2. A candidate should secure a minimum of 35% marks in the internal assessment in each subject (separately in theory and practical) to be eligible to appear for the University examination.

3. The internal assessment will be done by the department once during the course and final model exam which will be the same pattern of University Examination.
4. Each student should maintain a logbook and record the procedures they do and the work patterns they are undergoing. It shall be based on periodical assessment, evaluation of student assignment, preparation for seminar, clinical case presentation, assessment of candidate's performance in the sessional examinations, routine clinical works, logbook and record keeping etc.
5. Day to day assessment will be given importance during internal assessment and weightage for internal assessment shall be 20% of the total marks in each subject.
6. Sessional examination as mentioned above and the marks secured by the students along with their attendance details shall be forwarded to the Principal. Model examination shall be held three to four weeks prior to the University Examination and the report shall be made available to the Principal ten days prior to the commencement of the University Examination.

III.3. University Examinations:

- University Examination shall be conducted at the end of every academic year.
- A candidate who satisfies the requirement of attendance and internal assessment marks, as stipulated by the University shall be eligible to appear for the University Examination.
- One academic year will be twelve months including the days of the University Examination. Year will be counted from the date of commencement of classes which will include the inauguration day.
- The minimum pass for internal assessment is 35% and for the University Examination is 45%. However the student should score a total of 50% (adding the internal and external examination) to pass in each subject (separately for theory and practical)
- If a candidate fails in either theory or practical paper, he/she has to re-appear for both the papers (theory and practical)
- Maximum number of attempts permitted for each paper is five (5) including the first attempt.

- The maximum period to complete the course shall not exceed 6 years.
- All practical examinations will be conducted in the respective clinical areas.
- Number of candidates for practical examination should be maximum 12 to 15 per day
- One internal and external examiner should jointly conduct the theory evaluation and practical examination for each student during the final year.

III.4. Eligibility to appear university Examination:

A student who has secured 35% marks for Internal Assessment is qualified to appear for University Examination provided he/she satisfies percentage of attendance requirement as already mentioned at the III (1) of the clause.

III.5. Valuation of Theory – Revaluation Papers:

1. Valuation work will be undertaken by the examiners in the premises of the Examination Control Division in the Health Sciences Campus.
2. There will be **Re-Valuation** for all the University examinations. Fees for revaluation will be decided by the Principal from time to time.
3. Application for revaluation should be submitted within 10 days from date of result of examination declared and it should be submitted to the office with payment of fees as decided by the Principal.

III.6. Supplementary Examinations:

Every regular University examination will be followed by a supplementary examination which will normally be held within four to six months from the date of completion of the regular examination.

As stipulated under clause No. 2 under Internal Assessment, HOD will hold an internal examination three to four weeks prior to the date of the University Examination. Marks secured in the said examination or the ones secured in the internal examination held prior to the earlier University Examination whichever is more only will be taken for the purpose of internal assessment. HODs will send such details to the Principal ten days prior to the date of commencement of University examination.

Students who have not passed / cleared all or any subjects in the first University examination will be permitted to attend the second year classes. However, he / she can

appear for the final year University Examination, only if he / she clear all the subjects in the first year University examinations.

Same attendance and internal marks of the regular examination will be considered for the supplementary examination, unless the HOD furnishes fresh internal marks and attendance after conducting fresh examination.

Students of supplementary batches are expected to prepare themselves for the University Examinations. No extra coaching is expected to be provided by the Institution. In case at any time the Institution has to provide extra coaching, students will be required to pay fees as fixed by the Principal for the said coaching.

III.7. Rules regarding carryover subjects:

A candidate will be permitted to continue the second of the course even if he/she has failed in the first year University Examinations.

IV. Criteria for Pass in University Examination - Regulations:

IV.1. Eligibility criteria for pass in University Examination:

In each of the subjects, a candidate must obtain 50% in aggregate for a pass and the details are as follows:

- A separate minimum of 35% for Internal Assessment
- 45% in Theory & 35% in Oral / Viva
- A separate minimum of 50% in aggregate for Practical / Clinics (University Examinations)
- Overall 50% is the minimum pass in subject aggregate (University Theory + Viva / Oral + Practical + Internal Assessment)

IV.2. Evaluation and Grade:

1. Minimum mark for pass shall be 50% in each of the theory and practical papers separately (including internal assessment) in all subjects.
2. A candidate who passes the examination in all subjects within aggregate of 50% marks and above and less than 65% shall be declared to have passed the examination in the second class.

3. A candidate who passes the examination in all subjects in the first attempt obtaining not less than 65% of the aggregate marks for all the three years shall be declared to have passed the examination with First Class.
4. A candidate who secures an aggregate of 75% or above marks is awarded distinction. A candidate who secures not less than 75% marks in any subject will be deemed to have passed the subject with distinction in that subject provided he / she passes the whole examination in the first attempt.
5. A candidate who takes more than one attempt in any subject and pass subsequently shall be ranked only in pass class.
6. A Candidate passing the entire course is placed in Second class / First class / Distinction based on the cumulative percentage of the aggregate marks of all the subjects in the I and final University Examinations
7. Rank in the examination: - Aggregate marks of all two year regular examinations will be considered for awarding rank for the M.Sc Graduate Examination. For the courses where the number of students are more than 15 rank will be calculated as under :
 - Topmost score will be declared as First Rank
 - Second to the topmost will be declared as Second Rank
 - Third to the topmost will be declared as Third Rank

V. General considerations and teaching / learning approach:

There must be enough experience to be provided for self learning. The methods and techniques that would ensure this must become a part of teaching-learning process. Proper records of the work should be maintained which will form the basis for the students' assessment and should be available to any agency that is required to do statutory inspection of the school of the course.

Research Activities:

The candidate has to maintain a record of research activities done by him/her and keeps a project record (to be submitted to the Principal before Part II examination).

Part II Syllabus

Syllabus

Program Outcomes (PO):

1. PO1: Through knowledge on the subject.
2. PO2: Effective communication skills.
3. PO3: Knowledge in professional ethics.
4. P04: Leadership qualities and team work.
5. PO5: Problem Analysis and solving skills.
6. PO6: Detailed knowledge on research methodology.
7. PO7: Higher Technical skills and competencies.
8. PO8: Specilization in the subject
9. PO9: Employability in various sectors.
10. PO10: Employability in higher positions

Program Specific Outcomes (PSO)

1. PSO1: Advanced knowledge in Clinical cardiovascular procedures
2. POS3: Advanced Technical expertise in all procedures in Cardiac catheterization lab
3. POS4: Technical expertise in Heart failure therapy and Rhythm management
4. PSO5: Consultant in Pacemaker analysis, programming and follow up
5. PSO6: Teaching expertise for all procedures in cathlab.

MCVT 40 Soft Skills – Elective Course

Course and Course Outcomes

CO1: Attitude to continue lifelong learning.

CO2: Knowledge of gender issues and the attitude to handle such issues.

CO3: Knowledge of environmental issues and the attitude to work towards a sustainable future.

CO4: Competency to take decisions applying ethical values and knowledge of proper etiquette.

CO5: Competency to conduct research.

CO6: Communication skills including teaching skills.

First Year

Paper I - Basic Cardiology I (MCVT 11)

Course outcome

1. CO1: Core knowledge in Cardiac Anatomy
2. CO2: Core knowledge in cardiac physiology
3. CO3: Core knowledge in conduction system of heart
4. CO4: Core knowledge in cardiac pathology
5. CO5: Core knowledge in cardiac pharmacology

Contents

- **Knowledge in relevant CARDIAC ANATOMY**
- **Knowledge in relevant CARDIAC PHYSIOLOGY**
- **Knowledge in relevant CARDIAC PHARMACOLOGY**
- **Knowledge in relevant CARDIAC PATHOLOGY**

Paper II - Basic Cardiology II (MCVT 12)

Course outcome

1. CO1: Core knowledge in cardiac monitoring
2. CO2: Core knowledge in Radiation Physics and Application, Medical Electronics
3. CO3: Core knowledge in ECG
4. CO4: Core knowledge in Exercise ECG
5. CO5: Core knowledge in echocardiography.

Contents

- Knowledge in relevant Radiation physics and application
- Knowledge in reading the basics of ECG
- Knowledge in the basics of Echocardiography
- **Skill in Cardiac cathlab set up and equipments**
- Knowledge of Sterility in cathlab
- **Knowledge in relevant Diagnostic Adult and Pediatric procedures**
- Competency in Cardiopulmonary resuscitation
- Knowledge in cardioversion and defibrillators

Second Year

Paper I - Clinical Cardiology I (MCVT 21)

Course outcome

1. CO1: Advanced knowledge about Cardiac Catheterization lab
2. CO2: Advanced knowledge in Equipments in Cath-Lab
3. CO3: Detailed knowledge in Log Books, Registers in lab
4. CO4: Core knowledge and technical expertise in various diagnostic and therapeutic procedures in cathlab

Contents

- Knowledge of Coronary Angioplasty
- **Knowledge of Advanced Angioplasty – IVUS, ROTA, CTO, Bifurcation stenting etc.**
- Knowledge of Structural heart disease interventions in adults – PTMC, BAV, TAVI
- **Competency in Advanced cardiac support - IABP, ECMO**
- Knowledge of Cardiac transplantation

Paper II - Clinical Cardiology II (MCVT 22)

Course outcome

1. CO1: Detailed knowledge in Pacing and Electrophysiology
2. CO2: Core knowledge in the management of complications in lab
3. CO3: Recent advances in cardiovascular Technology

Contents

- Knowledge of indications of when to implant a pacemaker
- Knowledge of Pacemaker implantation including AICD & CRT
- **Knowledge of Electrophysiology – Basics and Advanced**
- **Prognosis of pacemaker implantation**
- Knowledge of Paediatric Cardiac interventions – Basic and Advanced
- Care of post implant patients
- **Knowledge of Peripheral angioplasty – including carotids**

WORK BOOK

They should have a work book which includes their daily cathlab work signed by in charge technician which should be submitted before final examination.

PROJECT WORK

Each student shall work on a project under a guide in the department (recommended by the Head of the Department) and submit the project work to the principal through the principal through the HOD, at least two months before completion of the course.

TEACHING RESPONSIBILITIES

They should take classes for B.Sc CVTS students on regular basis.

PAPER PRESENTATION

They have to attend at least one Cardiology conference during the tenure and present papers for the same.

TEXT BOOKS RECOMMENDED

1. Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine
2. Grossman's Cardiac Catheterization, Angiography and Intervention
3. Hurst's The Heart vol.1 & 2
4. Cardiac Catheterization: Peterson' Kirk L
5. Clinical Cardiac Electrophysiology: Josephson
6. Cardiac Catheterization, Angiography and Intervention : Baim, Donald S
7. Catheter Ablation of Cardiac Arrhythmias; Stephen Huang, Shoei K
8. Chou's Electrocardiography in Clinical Practice: Surawicz, Borys
9. Clinical Cardiac Pacing, Defibrillation and Resynchronization Therapy: Ellenbogen, Kenneth
10. Congenital Heart Disease: Textbook of Angiocardiography 2 vols.: Freedom
11. Congenital Heart Disease in Adults: Perloff, Joseph k
12. ECG made easy: Hampton, John. R
13. Echocardiography: Feigenbaum ,Harvey
14. Handbook of Exercise Testing :Constant ,Jules
15. Heart Sounds Made Easy : Brown, Elspeth M
16. IVUS Made Easy : Schoenhagen, Paul
17. Practical Handbook of Advanced Interventional Cardiology : Nguyer, Thach N
18. Primer of ECG : A simple and Deductive Approach : Misra, K P
19. Text book of Cardiovascular Medicine : Topol, Eric J
20. Textbook of Interventional Cardiology : Topol, Eric J
21. The Echo Manual : Oh, Jae K
22. The Clinical Recognition of Congenital Heart Disease : Perloff, Joseph K
23. Valvular Heart Disease: a Companion to Braunwald's heart disease : Otto, Catherine M
24. The Pathology of Congenital Heart Disease : Bharati, Saroja
25. The Cardiac Catheterization Handbook : Kern, Morton J

SCHEME OF EXAMINATION

M.Sc Cardiovascular Technology Degree Examination Distribution of Marks for each subject

Paper Code	Subject Name	University	Internal	Oral	Subject Total	Total	Aggregate
FIRST YEAR							1000
I	Paper I Basic Cardiology I	100	20	30	150	300	
II	Paper II Basic Cardiology II	100	20	30	150		
SECOND YEAR							
III	Paper III Clinical Cardiology I	100	20	30	150	700	
IV	Paper IV Clinical Cardiology II	100	20	30	150		
V	Project	100	50	50	200		
VI	Practical +Viva (150 + 50)	100	50	50	200		

PATTERN OF QUESTION PAPERS

All the question paper shall be of standard type. Each theory paper will be of 3 hours duration and shall consist of ten questions carry equal mark with a maximum of 100 marks. Theory paper in all subjects will consist of ten questions of 10 marks each or two sub questions in a ten mark main question.

IMPORTANT TELEPHONE NUMBERS

Amrita Institute of Medical Sciences : 0484-2801234/2851234
Principal's Office : 0484-2858132/2858331
Admission Office : 0484-2858373/2858373
Chief Programme Administrator : +91 7034028019, on call: 1919
Programme Co-ordinator : +91 7034028118, on call: 6976
