

**HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE,  
PADUR**

**B.Sc. (CARDIOVASCULAR TECHNOLOGY)**

Proposed by

School of Science and Humanities

Curriculum and Syllabus

2015

**HINDUSTAN UNIVERSITY**  
**HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE**  
**ACADEMIC REGULATIONS**

## **1. Vision, Mission & Objectives**

**1.1** The Vision of the Institute is to make everyone a success and no one a failure

In order to progress towards the vision, the Institute has identified itself with a mission to provide every individual with a conducive environment suitable to achieve his / her career goals, with a strong emphasis on personality development, and to offer quality education in all spheres of engineering, technology, applied sciences and management, without compromising on the quality and code of ethics.

**1.2** Further, the Institute always strives

- To train our students with the latest and the best in the rapidly changing fields of Engineering, Technology, Management, Science & Humanities.
- To develop the students with a global outlook possessing, state of the art skills, capable of taking up challenging responsibilities in the respective fields.
- To mould our students as citizens with moral, ethical and social values so as to fulfill their obligations to the nation and the society.
- To promote research in the field of Science, Humanities, Engineering, Technology and allied branches

**1.3** Aims and Objectives of the Institute are focused on

- Providing world class education in engineering, technology, applied science and management.
- Keeping pace with the ever changing technological scenario to help the students to gain proper direction to emerge as competent professionals fully aware of their commitment to the society and nation.
- To inculcate a flair for research, development and entrepreneurship.

## **2. Admission**

**2.1.** The admission policy and procedure shall be decided from time to time by the Board of Management (BOM) of the Institute, following guidelines issued by Ministry of Human Resource Development (MHRD), Government of India. The number of seats in each branch of the B.Sc. (Applied Science) programme will be decided by BOM as per the directives from MHRD, Government of India and taking into account the market demands. Some seats for Non Resident Indians and a few seats for foreign nationals shall be made available.

**2.2.** The student should have

- A pass in +2 (CBSE, Matriculation, State Board) or an equivalent with 12 years of Schooling from a recognized Board with Physics, Chemistry and Biology/ Botany and Zoology as subjects of study.
- Minimum 35% marks in each subject separately.

**2.3.** The selected candidates will be admitted to the B.Sc. programme after he / she fulfills all the admission requirements set by the Institute after payment of the prescribed fees.

**2.4.** In all matters relating to admission to the B.Sc. programme, the decision of the Institute and its interpretation given by the Chancellor of the Institute shall be final.

**2.5.** If at any time after admission, it is found that a candidate has not fulfilled any of the requirements stipulated by the Institute, the Institute may revoke the admission of the candidate with information to the Academic Council.

### **3. Structure of the programme**

**3.1.** The programme will have the following structure:

- i) A general programme comprising Basic Anatomy, Physiology, Pathology, Biochemistry and basics of Computer.
- ii) A core programme introducing the student to the foundations of Practical field.

**3.2.** The duration of the programme will be a minimum of 3 years. Every branch of the B.Sc. programme will have a curriculum and syllabi for the courses approved by the Academic Council.

**3.3** The academic programmes of the Institute follow the credit system.

**3.4.** For the award of degree, a student has to earn certain minimum total number of credits specified in the

curriculum of the relevant branch of study. The curriculum of the different programs shall be so designed that the minimum prescribed credits required for the award of the degree shall be within the limits of 120

**3.5.** The medium of instruction, examination and the language of the project reports will be English.

### **4. Faculty Advisor**

**4.1.** To help the students in planning their courses of study and for getting general advice on the academic programme, the concerned Department will assign a certain number of students to a Faculty member who will be called their Faculty Advisor.

### **5. Class Committee**

**5.1** A Class Committee consisting of the following will be constituted by the Head of the Department for each class:

- (i) A Chairman, who is not teaching the class.
- (ii) All subject teachers of the class.
- (iii) Two students nominated by the department in consultation with the class.

The Class Committee will meet as often as necessary, but not less than six times during a year.

The functions of the Class Committee will include:

- (i) Addressing problems experienced by students in the classroom and the laboratories.

- (ii) Analyzing the performance of the students of the class after each test and finding ways and means of addressing problems, if any.
- (iii) During the meetings, the student members shall express their opinions and suggestions of the class students to improve the teaching / learning process.

## 6. Grading

6.1 A grading system as below will be adhered to.

| Range of Marks | Letter Grade      | Grade points |
|----------------|-------------------|--------------|
| 90-100         | S                 | 10           |
| 80 - 89        | A                 | 09           |
| 70- 79         | B                 | 08           |
| 60-69          | C                 | 07           |
| 50-59          | D                 | 06           |
| 40-49          | E                 | 05           |
| < 40           | U                 | 00           |
|                | I<br>(Incomplete) |              |

### 6.2 GPA & CGPA

GPA is the ratio of the sum of the product of the number of credits  $C_i$  of course "i" and the grade points  $P_i$

earned for that course taken over all courses "i" registered by the student to the sum of  $C_i$  for all "i". That is,

$$GPA = \frac{\sum C_i P_i}{\sum C_i}$$

CGPA will be calculated in a similar manner, at any year, considering all the courses enrolled from first year onwards.

6.3. For the students with letter grade I in certain subjects, the same will not be included in the computation of GPA and CGPA until after those grades are converted to the regular grades.

6.4 Raw marks will be moderated by a moderation board appointed by the Vice-Chancellor of the University. The final marks will be graded using absolute grading system. The Constitution and composition of the moderation board will be dealt with separately.

## 7. Registration & Enrolment

7.1 Except for the first year, registration and enrollment will be done in the beginning of the year as per the schedule announced by the University.

7.2 A student will be eligible for enrollment only if he/she satisfies regulation 10 (maximum duration of the programme) and will be permitted to enroll if (i) he/she has cleared all dues in the Institute, Hostel & Library up to the end of the previous Year and (ii) he/she is not debarred from enrollment by a disciplinary action of the University.

**7.3.** Students are required to submit registration form duly filled in.

## **8. Registration requirement**

**8.1.** If a student finds his/her load heavy in any year, or for any other valid reason, he/she may withdraw from the courses within three weeks of the commencement of the year with the written approval of his/her Faculty Advisor and HOD. However the student should ensure that the total number of credits registered for in any year should enable him/her to earn the minimum number of credits per year for the completed years.

## **9. Continuation of programme**

**9.1.** For those students who have not earned the minimum required credit prescribed for that particular year examination, a warning letter to the concerned student and also to his parents regarding the shortage of his credit will be sent by the HOD after the announcement of the results of the University examinations

## **10. Maximum duration of the programme**

**10.1.** The normal duration of the programme is 3 years. However a student may complete the programme at a slower pace by taking more time, but in any case not more than 5 years excluding the years withdrawn on medical grounds or other valid reasons.

## **11. Temporary discontinuation**

**11.1.** A student may be permitted by the Dean (Academic) to discontinue temporarily from the programme for six months or a longer period for reasons of ill health or other valid reasons. Normally a student will be permitted to discontinue from the programme only for a maximum duration of 6 months.

## **12. Discipline**

**12.1.** Every student is required to observe discipline and decorous behavior both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the University.

**12.2.** Any act of indiscipline of a student reported to the (Academics) will be referred to a Discipline Committee so constituted. The committee will enquire into the charges and decide on suitable punishment if the charges are substantiated. The committee will also authorize the Dean (Academic) to recommend to the Vice-Chancellor the implementation of the decision. The student concerned may appeal to the Vice-Chancellor whose decision will be final. The Dean (Academic) will report the action taken at the next meeting of the Council.

**12.3.** Ragging and harassment of women are strictly prohibited in the University campus and hostels.

## **13. Attendance**

**13.1.** A student whose attendance is less than 75% in a year is not eligible to appear for the end – year examination. The details of all students who have less than 75%

attendance in a course will be announced by the teacher in the class. These details will be sent to the concerned HODs and (Academic).

**13.2.** Those who have less than 75% attendance will be considered for condonation of shortage of attendance. However, a condonation of 10% in attendance will be given on medical reasons. Application for condonation recommended by the Faculty Advisor, concerned faculty member and the HOD is to be submitted to the Dean (Academic) who, depending on the merits of the case, may permit the student to appear for the year end examination. A student will be eligible for this concession at most in one year during the entire degree programme. Application for medical leave, supported by medical certificate with endorsement by a Registered Medical Officer, should reach the HOD within seven days after returning from leave or, on or before the last instructional day of the year, whichever is earlier.

**13.3** As an incentive to those students who are involved in extra-curricular activities such as representing the University in Sports & Games, Cultural Festivals, and Technical Festivals, NCC/ NSS events, a relaxation of up to 10% attendance will be given subject to the condition that these students take prior approval from the officer – in-charge. All such applications should be recommended by the concerned HOD and forwarded to Dean (Academic) within seven instructional days after the programme / activity.

## **14. Assessment Procedure**

**14.1.** The Academic Council will decide from time to time the system of tests and examinations in each subject in each year.

**14.2** For each theory course, the assessment will be done as follows:

| <b>Internal Tests</b> | <b>End Year Examination</b> | <b>Total</b> |
|-----------------------|-----------------------------|--------------|
| <b>Max</b>            | <b>Max</b>                  |              |
| 25                    | 75                          | 100          |

Computer courses will be evaluated through internal examinations only.

Internal Assessment will be done based on the components below:

1. Written test/term test
2. Record Books
3. Assignments
4. Oral presentations/seminars
5. Skills/practical training acquired in Laboratory
6. Communication skills

**14.3** For practical courses, the assessment will be done by the subject teachers as below:

- (i) Weekly assignment/Observation note book / lab records – weightage 60%.
- (ii) Year- end examination of 3 hours duration including viva – weightage 40%.

**14.4** For courses on Physical Education, NSS, etc the assessment will be as satisfactory/not satisfactory only.

## **15. Make up Examination/Periodical Test**

**15.1.** Students who miss the year end examinations / periodical test for valid reasons are eligible for makeup examination /periodical test. Those who miss the year-end examination / periodical test should apply to the Head of the Department concerned within five days after he / she missed examination, giving reasons for absence.

**15.2.** Permission to appear for make-up examination/periodical test will be given under exceptional circumstances such as admission to a hospital due to illness. Students should produce a medical certificate issued by a Registered Medical Practitioner certifying that he/she was admitted to hospital during the period of examination / periodical test and the same should be duly endorsed by parent/guardian and also by a medical officer of the University within 5 days.

**15.3.** The student will be allowed to make up at the most two out of three periodical tests.

## **16. Declaration of results**

**16.1..** A candidate who secures not less than 40% of total marks prescribed for a course with a minimum of 40% of the marks prescribed for the year end examination shall be declared to have passed the course and earned the specified credits for the course.

**16.2** After the valuation of the answer scripts, the tabulated results are to be scrutinized by the Result Passing Boards of UG and PG programmes constituted by

the Vice-Chancellor. The recommendations of the Result Passing Boards will be placed before the Standing Sub Committee of the Academic Council constituted by the Chancellor for scrutiny. The minutes of the Standing Sub Committee along with the results are to be placed before the Vice-Chancellor for approval. After getting the approval of the Vice-Chancellor, the results will be published by the Controller of Examination / Registrar.

**16.3.** If a candidate fails to secure a pass in a course due to not satisfying the minimum requirement in the year end examination, he/she shall register and re-appear for the end year examination during the following year. However, the internal marks secured by the candidate will be retained for all such attempts.

**16.4.** If a candidate fails to secure a pass in a course due to insufficient sessional marks though meeting the minimum requirements of the year end examination, wishes to improve on his/her sessional marks, he/she will have to register for the particular course and attend the course with permission of the HOD concerned and with a copy marked to the Registrar. The sessional and external marks obtained by the candidate in this case will replace the earlier result.

**16.5.** A candidate can apply for the revaluation of his/her year -end examination answer paper in a theory course within 2 weeks from the declaration of the results, on payment of a prescribed fee through proper application to the

Registrar/Controller of Examinations through the Head of the Department. The Registrar/Controller of Examinations will arrange for the revaluation and the results will be intimated to the candidate concerned through the Head of the Department. Revaluation is not permitted for practical courses and for project work.

## 17. Grade Card

17.1 After results are declared, grade sheet will be issued to each student which will contain the following details:

- (i) Program and branch for which the student has enrolled.
- (ii) Year of registration.
- (iii) List of courses registered during the Year and the grade scored.
- (iv) Year Grade Point Average (GPA)
- (v) Cumulative Grade Point Average (CGPA).

## 18. Class / Division

Classification is based on CGPA and is as follows:

CGPA  $\geq$ 8.0 : **First Class with distinction**

7.0  $\leq$ CGPA < 8.0 : **First Class**

6.0  $\leq$ CGPA < 7.0 : **Second Class**

5.0  $\leq$ CGPA < 6.0 : **Third Class**

## 19. Transfer of credits

19.1 Within the broad framework of these regulations, the Academic Council, based on the recommendation of the transfer of credits committee so consulted by the

Chancellor may permit students to earn part of the credit requirement in other approved institutions of repute and status in the country or abroad.

## 20. Eligibility for the award of B.Sc.

20.1. A student will be declared to be eligible for the award of the B.Sc. Degree if he/she has

- i) Registered and successfully obtained credit for all the core courses;
- ii) Successfully acquired the credits in the different categories as specified in the curriculum corresponding to the discipline (branch) of his/her study within the stipulated time;
- iii) Has no dues to all sections of the Institute including Hostels, and
- iv) Has no disciplinary action pending against him/her.

The award of the degree must be recommended by the Academic Council and approved by the Board of Management of the University.

## 21. Power to modify

21.1. Notwithstanding all that has been stated above, the Academic Council shall modify any of the above regulations from time to time subject to approval by the Board of Management.



**HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE**  
**B.Sc Cardiovascular Technology**  
**CURRICULUM & Syllabus**  
**(Annual Pattern) 2015**  
**First Year**

| S. No.           | Course Code | Course Title   | L | T | P | Credits   | Total Contact Hours |
|------------------|-------------|--|---|---|---|-----------|---------------------|
| <b>Theory</b>    |             |  |   |   |   |           |                     |
| 1                | CVT101      | Anatomy  | 8 | - | 0 | 8         | 4                   |
| 2                | CVT102      | Cardiac Physiology   | 8 | - | 0 | 8         | 4                   |
| 3                | CVT103      | Biochemistry   | 8 | - | 0 | 8         | 4                   |
| 4                | CVT104      | Pathology, Microbiology, Pharmacology and therapeutics.          | 8 | - | 0 | 8         | 4                   |
| 5                | CVT105      | Medical electronics of Cardiac Technology                        | 8 | - | 0 | 8         | 4                   |
| 6                | BCS101      | Fundamentals of Computers  | 3 | - | 0 | 3         | 3                   |
| <b>Practical</b> |             |  |   |   |   |           |                     |
| 7                | CVT131      | Anatomy Practical  | 0 | 0 | 3 | 2         | 3                   |
| 8                | CVT132      | Cardiac Physiology Practical                                     | 0 | 0 | 3 | 2         | 3                   |
| 9                | CVT133      | Biochemistry Practical   | 0 | 0 | 3 | 2         | 3                   |
| 10               | CVT134      | Pathology, Microbiology, Pharmacology and therapeutics Practical | 0 | 0 | 3 | 2         | 3                   |
| 11               | CVT135      | Medical electronics of Cardiac Technology Practical              | 0 | 0 | 3 | 2         | 3                   |
| 12               | BCS131      | Computer laboratory  | 0 | 0 | 3 | 2         | 3                   |
| <b>Total</b>     |             |  |   |   |   | <b>55</b> | <b>41</b>           |

**HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE****B.Sc Cardio Vascular Technology****CURRICULUM & Syllabus****(Annual Pattern) 2015****Second Year**

| <b>S. No.</b>    | <b>Course Code</b> | <b>Course Title</b>                 | <b>L</b> | <b>T</b> | <b>P</b> | <b>Credits</b> | <b>Total Contact Hours</b> |
|------------------|--------------------|-------------------------------------|----------|----------|----------|----------------|----------------------------|
| 1                | <b>CVT201</b>      | Basics of ECG                       | 8        | 0        | 0        | 8              | 4                          |
| 2                | <b>CVT202</b>      | Exercise ECG                        | 8        | 0        | 0        | 8              | 4                          |
| 3                | <b>CVT203</b>      | Echo and Holter recording           | 8        | 0        | 0        | 8              | 4                          |
| 4                | <b>EC2905</b>      | Biomaterials and Artificial Organs  | 3        | 0        | 0        | 3              | 3                          |
| <b>Practical</b> |                    |                                     |          |          |          |                |                            |
| 5                | <b>CVT231</b>      | Basics of ECG Practical             | 0        | 0        | 3        | 2              | 3                          |
| 6                | <b>CVT232</b>      | Exercise ECG Practical              | 0        | 0        | 3        | 2              | 3                          |
| 7                | <b>CVT233</b>      | Echo and Holter recording Practical | 0        | 0        | 3        | 2              | 3                          |
| <b>Total</b>     |                    |                                     |          |          |          | <b>33</b>      | <b>24</b>                  |

**HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE**

**B.Sc Cardiovascular Technology**

**CURRICULUM & Syllabus**

**(Annual Pattern) 2015**

**Third Year**

| <b>S. No.</b>    | <b>Course Code</b> | <b>Course Title</b>                             | <b>L</b> | <b>T</b> | <b>P</b> | <b>Credits</b> | <b>Total Contact Hours</b> |
|------------------|--------------------|---|----------|----------|----------|----------------|----------------------------|
| 1                | CVT301             | Cardiac Catheterization Basics-Part I           | 8        | 0        | 0        | 8              | 4                          |
| 2                | CVT302             | Cardiac Catheterization- Part II                | 8        | 0        | 0        | 8              | 4                          |
| 3                | CVT303             | Cardiac Catheterization- Part III               | 8        | 0        | 0        | 8              | 4                          |
| 4                | PHC103             | Hospital and Patient Relation Management        | 3        | 0        | 0        | 3              | 3                          |
| <b>Practical</b> |                    |   |          |          |          |                |                            |
| 5                | CVT331             | Cardiac Catheterization Basics-Part I Practical | 0        | 0        | 3        | 2              | 3                          |
| 6                | CVT332             | Cardiac Catheterization- Part II Practical      | 0        | 0        | 3        | 2              | 3                          |
| 7                | CVT333             | Cardiac Catheterization- Part III Practical     | 0        | 0        | 3        | 2              | 3                          |
| <b>Total</b>     |                    |   |          |          |          | <b>33</b>      | <b>24</b>                  |

| <b>Year</b>  | <b>Credits</b> |                  |
|--------------|----------------|------------------|
|              | <b>Theory</b>  | <b>Practical</b> |
| <b>I</b>     | <b>43</b>      | <b>12</b>        |
| <b>II</b>    | <b>27</b>      | <b>6</b>         |
| <b>III</b>   | <b>27</b>      | <b>6</b>         |
| <b>TOTAL</b> | <b>97</b>      | <b>24</b>        |
|              | <b>121</b>     |                  |

**‘HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE**  
**B.Sc Cardio Vascular Technology**  
**(Annual Pattern) 2015**  
**EVALUATION**

| S. No.          | Subject Code         | Subject Name   | Marks |
|-----------------|----------------------|--|-------|
| <b>I YEAR</b>   |                      |  |       |
| 1.              | <b>CVT101</b>        | Anatomy  | 100   |
| 2.              | <b>CVT102</b>        | Cardiac physiology   | 100   |
| 3.              | <b>CVT103/PFT103</b> | Biochemistry   | 100   |
| 4.              | <b>CVT104</b>        | Pathology, microbiology, pharmacology and therapeutics           | 100   |
| 5.              | <b>CVT105</b>        | Medical electronics of cardiac technology                        | 100   |
| 6.              | <b>CVT106</b>        | Fundamentals of Computers  | 100   |
| 7.              | <b>CVT131</b>        | Anatomy Practical  | 100   |
| 8.              | <b>CVT132</b>        | Cardiac physiology Practical                                     | 100   |
| 9.              | <b>CVT133/PFT133</b> | Biochemistry Practical   | 100   |
| 10.             | <b>CVT134</b>        | Pathology, microbiology, pharmacology and therapeutics Practical | 100   |
| 11.             | <b>CVT135</b>        | Medical electronics of cardiac technology Practical              | 100   |
| 12.             | <b>BCS131</b>        | Computer Laboratory  | 100   |
| <b>II YEAR</b>  |                      |  |       |
| 13.             | <b>CVT201</b>        | Basic of ECG   | 100   |
| 14.             | <b>CVT202</b>        | Exercise ECG   | 100   |
| 15.             | <b>CVT203</b>        | ECHO and HOLTER recording  | 100   |
| 16.             | <b>EC2905</b>        | Biomaterials and artificial organs                               | 100   |
| 17.             | <b>CVT231</b>        | Basic of ECG Practical   | 100   |
| 18.             | <b>CVT232</b>        | Exercise ECG Practical   | 100   |
| 19.             | <b>CVT233</b>        | ECHO and HOLTER recording Practical                              | 100   |
| <b>III YEAR</b> |                      |  |       |
| 20.             | <b>CVT301</b>        | Cardiac catheterization basics part -1                           | 100   |
| 21.             | <b>CVT302</b>        | Cardiac catheterization part -2                                  | 100   |
| 22.             | <b>CVT303</b>        | Cardiac catheterization part-3                                   | 100   |
| 23.             | <b>PHC103</b>        | Hospital and Patient relation Management                         | 100   |
| 24.             | <b>CVT331</b>        | Cardiac catheterization basics part -1 Practical                 | 100   |
| 25.             | <b>CVT332</b>        | Cardiac catheterization part -2 Practical                        | 100   |
| 26.             | <b>CVT333</b>        | Cardiac catheterization part-3 Practical                         | 100   |

**HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE**

**B.Sc Cardiovascular Technology**

**First Year**

**CVT 101 ANATOMY**

| L | T | P | C |
|---|---|---|---|
| 8 | 0 | 0 | 8 |

**OBJECTIVES:** To impart knowledge to the students on basics of Human Anatomy

**OUTCOMES:** After completion of the course, the students will have

- understanding of the basics of Human Anatomy
- knowledge on the anatomy of different systems

**UNIT I GENERAL INTRODUCTION**

**12 periods**

General introduction to anatomy

**UNIT II OSTEOLOGY**

**18 periods**

Upper limb– clavicle, scapula, humerus, radius, ulna, lower limb-femur, hipbone, sacrum, tibia, fibula Vertebral column

**UNIT III THORAX**

**18 periods**

Inter costal space, pleura, bony thoracic cage, ribs, sternum & thoracic vertebrae

**UNIT IV ANATOMY OF CARDIOVASCULAR SYSTEM**

**24 periods**

Anatomy of Heart –Surface anatomy, Gross anatomy, Cardiac Chambers Septa, Valves, Pericardium-Arteries, Veins, Lymphatics, Aorta and branches, Venous drainage, Pulmonary vessel and circulation. Coronary Circulation and coronary venous drainage Conduction System of Heart

**UNIT V LUNGS**

**10 periods**

Trachea, bronchial tree

**UNIT VI MYOLOGY**

**16 periods**

Muscles of thorax, muscles of upper limb (arm & fore arm)

Flexor and extensor group of muscles (origin, insertion, nerve supply, action)

**Unit VII HISTOLOGY**

**12 periods**

Types of tissue, Epithelia, Squamous Glandular Transitional Cartilage- Connective tissue – bone, fibrous tissue, muscle

**Unit VIII EXCRETORY SYSTEM**

**10 periods**

Kidney, ureters, bladder, structure of nephrons

**REFERENCE BOOKS**

1. William Davis (P) understanding Human Anatomy and Physiology MC Graw Hill.
2. Chaurasia –A Text book of Anatomy T.S. Ranganathan – A text book of Human Anatomy.
3. Fattana, Human anatomy (Description and applied) Saunder's & C P Prism Publishers, Bangalore – 1991
4. Ester. M. Grishcimer, Physiology & Anatomy with Practical Considerations, J.P. Lippin Cott. Philadelphia.

**L = 120 Periods**

## CVT 102 CARDIAC PHYSIOLOGY

| L | T | P | C |
|---|---|---|---|
| 8 | 0 | 0 | 8 |

**OBJECTIVES:** To educate the students on basics of Human Physiology

**OUTCOMES:** Completion of the course will enable the students to

- gain a wide knowledge on the physiology of cardiovascular system.
- get a good exposure on cardiac cycle, cardiac output and circulation

### **Unit I GENERAL INTRODUCTION**

**8 periods**

Functions, Circulation of Blood, Central Control of Cardiovascular System

### **Unit II CARDIAC EXCITATION AND CONTRACTION**

**12 periods**

Mechanism of contraction, Sinoatrial node function, The cardiac conduction system, Atrioventricular node function, Autonomic regulation of the heart rate.

### **Unit III VASCULAR SMOOTH MUSCLE**

**10 periods**

Mechanism of Contraction, Pharmacomechanical coupling, automaticity

### **Unit IV CARDIAC CYCLE**

**10 periods**

Mechanical events, Arterial cycle and central venous pressure cycle, Clinical aspects of human cardiac cycle

### **Unit V CARDIAC OUTPUT**

**10 periods**

Fick principle, Thermo dilution and indicator dilution methods, Pulse Doppler methods, miscellaneous methods

### **Unit VI HEMODYNAMICS**

**10 periods**

Relationship between pressure, flow and resistance, Frank-Starling law, Preload, afterload and contractility, Control of stroke volume and cardiac output.

### **Unit VII CIRCULATION**

**8 periods**

Coronary, Cerebral, Pulmonary and Cutaneous circulation

**Unit VIII CARDIAC BLOOD VESSEL CONTROL MECHANISMS & COORDINATED  
CARDIOVASCULAR RESPONSES** **14 periods**

Cardiovascular receptors, reflexes and central control, control of blood vessel-mechanisms-Local control, Nervous control, Hormonal control, Posture, Valsalva manoeuvre, Exercise, Diving reflex

**Unit IX PHYSIOLOGY OF HEMATOLOGY AND COAGULATION** **10 periods**

Blood groups and blood transfusion Hemostasis, Circulation of fluid between plasma, interstitium lymph

**Unit X RESPIRATORY PHYSIOLOGY** **8 periods**

Mechanics of respiration, Principles of gas exchange & regulation

**Unit XI CARDIOVASCULAR RESPONSES ION PATHOLOGICAL SITUATIONS** **10 periods**

Shock and hemorrhage, Syncope, Essential hypertension, chronic cardiac failure

**Unit XII** **10 periods**

Physiology of Urinary Excretion, Excretion of contrast agents, contrast induced Nephropathy and How to avoid it

**L = 120 Periods**

**REFERENCE BOOKS**

1. Guyton (Arthur) Text Book of Physiology. Latest Ed. Prism publishers.
2. Chatterjee (CC) Human Physiology Latest Ed. Vol-1, Medical Allied Agency.
3. Choudhari (Sujith K) Concise Medical Physiology Latest Ed. New Central Book.
4. Ganong (William F) Review of Medical Physiology. Latest Ed. Appleton.



## CVT 103/PFT103 BIOCHEMISTRY

| L | T | P | C |
|---|---|---|---|
| 8 | 0 | 0 | 8 |

**OBJECTIVES:** To impart knowledge to the students on principles of Biochemistry

**OUTCOMES:** Completion of the course will enable the students

- To understand and appreciate the structure and functions of Protein, lipids and carbohydrates.
- To know about the composition and biological properties of carbohydrate lipid and protein
- To understand the nutrition aspects of Biomolecules

### **Unit I ACIDS AND BASES**

**12 Periods**

Definition, pH, Henderson – Hasselbalch equation, Buffers, Indicators, Normality, Molarity, Molality, fluid and electrolyte balance

### **Unit II CARBOHYDRATES**

**16 Periods**

Structure, Classification & Functions (Monosaccharides, Disaccharides, Polysaccharides, Homopoly- saccharides, Heteropolysaccharudes), glycoproteins

### **Unit III PROTEINS**

**16 Periods**

Amino acids, Classification & Structure of proteins, Physical & Chemical Properties of proteins, Denaturation, Antigen, Antibody Types, Plasma proteins, Blood clotting

### **Unit IV LIPIDS**

**20 Periods**

Chemical structure, functions & Classification of fatty acids (Essential fatty acids & non-essential fatty acids, MUFA, PUFA); Classification of lipids: Triacylglycerols, Phospholipids, Lipoproteins, Steroids, Amphipathic lipids, miscelles, Fluid mosaic model

### **Unit IV NUCLEIC ACIDS**

**12 Periods**

Purines and pyrimidine, Structure of DNA, Watson & Crick model of DNA, Structure of RNA & its types

**Unit V ENZYMES****14 Periods**

Definition, Nomenclature, Classification, Factors affecting enzyme activity, Active site, Coenzyme, Enzyme Inhibition, Mechanism of enzyme action, Units of enzyme, Isoenzymes, Enzyme pattern in diseases.

**Unit VI VITAMINS & MINERALS****16 Periods**

Fat soluble vitamins (A, D, E, K), Water soluble vitamins, B-complex vitamins & C, Essential Macro elements (Calcium, Phosphorus, Magnesium, Sodium, Potassium, Chlorine and sulphur) and Trace elements- Calorific value of foods, Basal metabolic rate (BMR), respiratory quotient (RQ) Specific dynamic action (SDA), Balanced diet – Marasmus & Protein Energy Malnutrition – Kwashiorkar

**Unit VII HORMONES****14 Periods**

Classification, Mechanism of action, Hypothalamic hormones, Pituitary, Anterior, posterior, Thyroid, Adrenal cortex, Adrenal medulla, Gonad hormones, Menstrual cycle, GI hormones.

**L=120 Periods****REFERENCE BOOKS**

1. Harold Varley, Practical Clinical Biochemistry, 4<sup>th</sup> Edition, CBS Publishers, New Delhi.
2. Carl A. Burtis, PhD and David E. Bruns TEITZ Fundamentals of Clinical chemistry, 6<sup>th</sup> edition, Saunders, 2008.
3. Lawrence A. Kaplan, and Amadeo J. Pesce, Clinical chemistry 5<sup>th</sup> Edition, Elsevier, 2010.
4. Ramakrishna(S) Prasanna(KG), Rajna ® Text book of Medical Biochemistry Latest Ed Orient longman Bombay –1980
5. Vasudevan (DM) Sreekumari(S) Text book of Biochemistry for Medical students, Latest Ed 6. DAS (Debajyothi) Biochemistry, Latest ED Academic, Publishers, Calcutta – 1992

## CVT 104 PATHOLOGY, MICROBIOLOGY, PHARMACOLOGY AND THERAPEUTICS

| L | T | P | C |
|---|---|---|---|
| 8 | 0 | 0 | 8 |

**OBJECTIVES:** This course will cover common cardiovascular diseases, their related pathology and microbiology and outline of clinical presentation and management of these conditions including medical and surgical interventions.

**OUTCOMES:** Completion of the course will enable the students

- To understand patho physiology of coronary artery disease
- To gain in depth knowledge in the mechanism of Pharmacological agents

### PATHOLOGY

#### UNIT I CORONARY ARTERY DISEASE

**8 Periods**

Pathophysiology and clinical recognition, Angina Pectoris, Symptomatic and asymptomatic myocardial ischemia, Types and locations of myocardial infarction Thrombolytic therapy Medical treatment, Percutaneous interventions, Surgical treatment Cardiac rehabilitation.

#### UNIT II VALVULAR HEART DISEASE

**4 Periods**

Mitral stenosis, Mitral regurgitation, Aortic stenosis, Aortic regurgitation, Tricuspid valve disease -Combined valve diseases, Infective Endocarditis.

#### UNIT III SYSTEMIC HYPERTENSION

**4 Periods**

Essential and Secondary Hypertension

#### UNIT IV MYOCARDIAL AND PERICARDIAL DISEASES

**4 Periods**

Dilated, Hypertrophic, and Restrictive cardiomyopathy, Myocarditis, Pericardial effusion Constrictive pericarditis Cardioac tamponade.

#### UNIT V CONGENITAL HEART DISEASE

**9 Periods**

**i)Acyanotic**-Atrial septal defect Ventricular septal defect Patent ductus arteriosus Congenital valvular disease Coarctation of aorta.

**(ii)Cyanotic**-Tetralogy of Fallot

Double outlet right ventricle Pulmonary atresia Transposition of great arteries Truncus arteriosus, Total anomalous pulmonary venous connection.

**Unit VI PERIPHERAL VASCULAR DISEASE** **4 Periods**

Atherosclerotic peripheral vascular disease, Aortic aneurysms Aortic dissection Takayasu arteritis

**Unit VII ELECTRICAL DISTURBANCES OF THE HEART** **4 Periods**

Sinus node dysfunction, Arrhythmias and conduction disturbances  
Treatment of arrhythmias – pharmacological, radiofrequency ablation and surgery

**Unit VIII PULMONARY HYPERTENSION** **4 Periods**

Primary pulmonary hypertension, pulmonary thromboembolism

**Unit IX HEART FAILURE** **4 Periods**

Surgical and Medical treatment

## **MICROBIOLOGY**

**Unit I GENERAL INTRODUCTION** **8 Periods**

Common microorganisms, Sepsis, Aseptic precautions, Sterilization procedures

**Unit II INTRODUCTION** **7 Periods**

Modes / routes of Drug Administration (Rationale)  
Intra Venous Fluids: Crystalloids, Colloids

**Unit III ANTI-ANGINAL AGENTS** **12 Periods**

Beta blockers-propranolol, atenolol, metoprolol, bisoprolol carvedilol, esmolol. Nitrates-nitroglycerine, isosorbide dinitrate, isosorbide mononitrate, transdermal nitrate patches Calcium channel blockers-nifedipine, verapamil, diltiazem, amlodipine Nicorandil, Trimetazidine, Ranolazine, Ivabradine.

## **PHARMACOLOGY AND THERAPEUTICS**

**Unit I ANTI FAILURE AGENTS** **12 Periods**

Diuretics-furosemide, torsemide, thiazide diuretics, metolazone, spironolactone, combination diuretics, Angiotensin converting enzyme (ACE) inhibitors ARB (Angiotensin Receptor Blocker) – Valsartan Cosartan Telmisartan – captopril Enalapril, ramipril, lisinopril, ACE inhibitors for diabetics and hypertensive renal disease, Digitalis and acute ionotropes – digoxin, dobutamine, dopamine, adrenaline, noradrenaline, isoprenaline, Beta Blockers – Carvedilol, Bisoprolol, metoprolol.

## **Unit II ANTITHROMBOTIC AGENTS**

**10 Periods**

Platelet inhibitors: aspirin, clopidogrel, Prasugrel, ticagrelor , Anticoagulants: heparin, low molecular weight heparin, warfarin fondaparinux\_ Fibrinolytics: streptokinase, urokinase Tenecteplase reteplase, Glycoprotein 2b3a antagonists: abciximab, tirofiban, eptifibatide

## **Unit III ANTI- ARRHYTHMIC AGENTS**

**8 Periods**

Amiodarone, adenosine, verapamil, ivabradine, diltiazem, lidocaine, mexiletine, Phenytoin, flecainide, bretylium, atropine, Isoprenaline

## **Unit IV LIPID LOWERING DRUGS**

**6 Periods**

Statins, ezetimibe, niacin, fenofibrate , Saroglitazar

## **Unit V ANTI-HYPERTENSIVE DRUGS**

**10 Periods**

Diuretics, beta-blockers, ACE inhibitors, calcium antagonists, direct Vasodilators, centrally acting and peripherally acting vasodilators. Angiotensin Receptor Blocker – Valsartan Losartan Telmisartan olmesartan

## **Unit VI ANAPHYLAXIS, DRUG REACTIONS, DRUG INTERACTION PROTAMINE**

**12 Periods**

Narcotics: morphine, pethidine, fentanyl-Sedatives: diazepam, midazolam -Steroids: hydrocortisone, prednisolone, Antihistamines: diphenhydramine -Antibiotics: penicillins, cephalosporins, aminoglycosides -Antacids and proton pump inhibitors -Anaesthetic agents: local general - Anaphylaxis, Drug reactions, Drug interaction (Basics)

**L = 120 Periods**

## **REFERENCE BOOKS**

1. Culling Histopathology techniques
2. Bancroft Histopathology techniques
3. Todd & Sanford Clinical Diagnosis by laboratory method

4. Dacie & Lewis – Practical Haematolog
5. Ramanic Sood, Laboratory Technology (Methods and interpretation) 4th Ed. J.P. Bros, New Delhi –1996).
6. Satish Gupta Short text book of Medical Laboratory for technician J.P. Bros, New Delhi – 1998
7. Sachdev K.N. Clinical Pathology and Bacteriology 8th Ed, J.P. Bros, 26 New Delhi-1991.
8. Krishna - Text book of Pathology, Orient Longman PVT Ltd. Bacteriology 8th Ed, J.P. Bros, New Delhi-1991.
9. R. S. Satoskar, S.D. Bhandarkar, S. S. Ainapure, Pharmacology and Pharmacotherapeutics, 18th Edition, single Volume, M/S Popular Prakashan, 350, Madan Mohan Marg, Tardeo, Bombay – 400 034.
10. 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.
11. Laurence and Bennet, Clinical Pharmacology, ELBS Edition, 9th Edition.

**CVT 105 MEDICAL ELECTRONICS OF CARDIAC TECHNOLOGY  
BIOMEDICAL INSTRUMENTATION AND BASIC ECG**

| L | T | P | C |
|---|---|---|---|
| 8 | 0 | 0 | 8 |

**Objectives:** To impart knowledge to the students on various electronic equipments that are used in diagnosis of cardiac disorders.

**Outcomes:** The course will enable the students

- To learn regarding various medical equipments used in the diagnosis of various disorders relating to heart.
- To learn about equipments used during cardiac procedures.

**UNIT 1**

**20 periods**

Introduction to medical physics, Blood pressure recording, Pressure transducers, Defibrillators, Cathode ray tubes and physiological monitors, Impedance plethysmography, Pulse oximetry

**UNIT 2**

**25 Periods**

Medical ultrasound and Doppler, Ionic currents and Electrocardiography Electrocardiographic processing and display system, Radiation physics, Techniques of monitoring radiation exposure, Measures to reduce radiation exposure. Computer use in medical care and data entry

**UNIT 3**

**25 Periods**

**Remote Monitoring Devices-**Telemetry Devices for pacemaker and device monitoring  
Implantable loop recorder (2-3 years) External loop Recorder (10 – 15 days)  
Pacemaker programmers – programming lessons and parameters, Principles of 3D electro-anatomic mapping (CARTO and ENSITE)

**UNIT 4**

**25 Periods**

Fundamental principles of electrocardiography, Cardiac electrical field generation during activation, Cardiac wave fronts, Cardiac electrical field generation during ventricular recovery, Electrocardiographic lead systems, Standard limb leads, Precordial leads and the Wilson central terminal, Augmented limb leads, The hexaxial reference frame and electrical axis, Recording adult and pediatric ECG.

**UNIT 5**

**25 Periods**

The normal electrocardiogram, Atrial activation The normal P wave Atrial repolarization, Atrioventricular node conduction and the PR segment, Ventricular activation and the QRS complex, Ventricular recovery and ST-T wave, U wave, Normal variants.

**REFERENCE BOOKS**

C. Raja Rao, Sujoy K. Guha, Principles of Medical Electronics and Biomedical Instrumentation, University Press, 2001.



|   |  |          |          |  |          |          |          |
|---|--|----------|----------|--|----------|----------|----------|
| <b>BCS 101</b>  | <b>FUNDAMENTALS OF COMPUTERS</b><br>(Common to B. Sc. Physics (Nano Technology), B. Sc. Analytical Chemistry, B.Sc. (Cardiovascular Technology and B.Sc. (Perfusion Technology)) |          |          | <b>L</b>   | <b>T</b> | <b>P</b> | <b>C</b> |
|   | <b>3</b>   | <b>0</b> | <b>0</b> | <b>3</b>   |          |          |          |
| <b>Goal</b>   | To introduce computer fundamentals.  |          |          |  |          |          |          |
| <b>OBJECTIVES</b>   |  |          |          | <b>OUTCOMES</b>  |          |          |          |
| The course should enable the students to  |  |          |          | The student should be able to  |          |          |          |
| Learn the major components of a Computer system.  |  |          |          | Have understood the interaction between different components of Computer system and number system. |          |          |          |
| Learn the computer information Concepts. Understand the basic concepts of computer programming. |  |          |          | Perform conversions from one number system to another.   |          |          |          |
| Learn the types of software   |  |          |          | Design and develop flowcharts, algorithms and pseudo code for the given problem.                   |          |          |          |
| Understand the fundamentals of computer networks  |  |          |          | Have understood the fundamental concepts of OS and computer networks                               |          |          |          |

### **UNIT 1: COMPUTER FUNDAMENTALS**

**9 Periods**

Introduction - Evolution of Computers - Generations of Computer - Classification of Computers - Application of computers - Computer Organisation: CPU, Memory, ALU, Control Unit, I/O unit - Secondary Storage Devices - Booting

### **UNIT 2: INFORMATION CONCEPTS**

**9 Periods**

**Number System:** Binary, Octal and Hexadecimal and conversion from one number system to another - Data and its representation - Information and its characteristics - Categories of Information - Levels of information - Levels of Information

**Data Storage and retrieval:** Concept of file - record and field

### **UNIT 3: COMPUTER PROGRAMMING**

**9 Periods**

**Problem Solving Techniques:** Algorithms, Flowchart, Pseudo code - Program Control Structures - Programming Paradigms - Programming Languages -Generations of Programming Languages - Language translators - Characteristics of Good Programming Language

### **UNIT 4: INTRODUCTION TO SOFTWARE**

**9 Periods**

Definition - Types of Software -System software: Operating System, Functions of OS, Overview of DOS, Windows and Linux.

**Application software:** Word Processor, Spread Sheet, Database concepts, Flat file versus Database.

## **UNIT 5: COMPUTER NETWORK CONCEPTS**

**9 Periods**

Introduction to Computer Networks - Evolution - Network Architecture - Applications and usage of Internet - Browser and its types - Domain Name System (DNS), WWW, Electronic Mail (e-mail) - Search Engines and Intranets.

**TOTAL: 45 Periods**

### **TEXT BOOKS**

1. P.K. Sinha & P. Sinha, "Computer Fundamentals", BPB Publications, 4th edition, 2004  
ITL Education Solution Limited.
2. Ashok Kamthane, "Computer Programming", Pearson Education Inc 2007.

### **REFERENCE BOOKS**

- 1 .Excel-Missing Manual, Mathew McDonald, O Reilly Press
2. Fundamentals of Computer – V.Rajaramanna ( Prentice Hall )
3. Computers and Commonsense Hunt, J. Shelley, Prentice Hall of India

### CVT 131 ANATOMY PRACTICAL

L T P C  
0 0 3 2

**Objective:** To make the students conversant with the practical aspects of anatomy.

**List of Exercises:**

a. Histology:

Identification  
general features  
heart muscle  
Valves and Atherosclerosis

b. Heart:

Cut section  
Anatomy and identification of structure

**P = 45 Periods**

### CVT 132 CARDIAC PHYSIOLOGY PRACTICAL

L T P C  
0 0 3 2

**Objective:** To train the students for the processes and techniques related to cardiac physiology

**List of Exercises:**

1. The compound Microscope
2. White Blood Cell count Red Blood Cell count Determination
3. Determination of ESR-By Westergren's method
4. Determination of Blood Groups
5. Calculation of Blood indices-MCH, MCHC
6. Measurement of human blood pressure
7. Examination of Respiratory system to count respiratory rate and measure inspiration and respiration

**P = 45 Periods**

### CVT 133/PFT133 BIOCHEMISTRY PRACTICAL

L T P C  
0 0 3 2

**Objective:** To expose and train the students with laboratory experiments / tests related to the identification of biomolecules

**List of Exercises:**

**Qualitative Tests:**

- a. Carbohydrates: Molisch's test, Fehling's test, Benedict's test, Seliwanoff's test
- b. Lipids: Solubility test, Emulsification Test, Saponification test
- c. Proteins: Heat Coagulation test, Isoelectric precipitation test

**P = 45 Periods****CVT134 PATHOLOGY, MICROBIOLOGY, PHARMACOLOGY AND  
THERAPEUTICS PRACTICAL****L T P C  
0 0 3 2**

**Objective:** To educate and practically train the students in the areas of pathology, microbiology, pharmacology and therapeutics.

**List of Exercises:**

1. Clinical Pharmacy and drug formulation: Nomenclature of drugs – Code name, chemical name, Nonproprietary name & trade name
2. Sources of drug information: Phamacopoeia, Text book, journals
3. Sources of drugs: a) Plant source- Alkaloids, glycoside, oils, gum, mucilage & carbohydrates. b)Animal source , c)mineral source, d) synthetic source & e) genetic engineering
4. Packing: vial, ampoule, strip packaging, blister packaging tube cylinder & Drug information sheet.
5. Variations in drug response
6. Drug dosage forms
7. Dosage calculation
8. Prescription Writing

**P = 45 Periods****CVT 135 MEDICAL ELECTRONICS OF CARDIAC TECHNOLOGY PRACTICAL****L T P C  
0 0 3 2**

**Objective:** To give a practical exposure on the working of various electronic equipment employed in cardiac technology.

**List of Exercises:**

1. Physiological Transducers:-Classification of transducers, performance characteristics ( static and dynamic), pressure transducers :- LVDT and strain gauge pressure transducers, piezo-electric transducers

2. Defibrillators: Need, DC defibrillator, defibrillator electrodes, DC defibrillator with synchronizer, AED, Implantable defibrillators, Types of defibrillators, Pacer-Cardioverter defibrillator, Cardioversion.
3. CRT and function, applications.
4. Electrocardiograph:-Block diagram, ECG leads, Effects of artifacts on ECG.
5. Impedance plethysmography
6. Oximetry, types of oximetry and pulse oximeter.

**P = 45 Periods**

|  |  |   |
|--|--|---|
| <b>BCS 131</b>   | <b>COMPUTER LABORATORY</b><br>(Common to B. Sc. Physics (Nano Technology), B. Sc. Analytical Chemistry, B.Sc. (Cardiovascular Technology and B.Sc. (Perfusion Technology)) | <b>L T P C</b><br><b>0 0 3 2</b>  |
| <b>Goal</b>  | <b>To impart computational skills using computer software</b>  |   |
| <b>OBJECTIVES</b>  |  | <b>OUTCOMES</b>   |
| <p>The course should enable the students to</p> <p>Gain an exposure to work with OS commands</p> <p>Gain knowledge about word processing, Spreadsheet and Databases.</p> |  | <p>The students should be able to</p> <p>Work with DOS and Linux commands in command mode.</p> <p>Use word processors to create document, table, text formatting and Mail merge options.</p> <p>Use spreadsheet for calculations using formula editor, creating different types of charts and including pictures etc.,</p> <p>Use database software to create databases, design queries and generate forms and reports.</p> |

### LIST OF EXPERIMENTS

- a) **DOS Commands**
- b) **Basic Linux Commands**
- c) **Word Processing**

1. Document creation, Text manipulation with Scientific notations.
2. Table creation, Table formatting and Conversion.
3. Mail merge and Letter preparation.
4. Drawing - flow Chart
- d) Spread Sheet**
5. Chart - Line, XY, Bar and Pie.
6. Formula - formula editor.
7. Spread sheet - inclusion of object, Picture and graphics, protecting the document
- e) Database**
8. Creation of Database
9. Forms
10. Queries
11. Reports

**P= 45 Periods**

**Second Year**  
**CVT 201 BASIC OF ECG**

| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|----------|----------|----------|----------|
| <b>8</b> | <b>0</b> | <b>0</b> | <b>8</b> |

**Objective:** To impart knowledge to the students on Electrocardiography

**Outcome:** Completion of the course will enable the students to learn about the basics of ECG and its use in the diagnosis of cardiac diseases.

**UNIT 1**

**24 Periods**

The abnormal electrocardiogram, Left atrial abnormality, Right atrial abnormality  
Left ventricular hypertrophy and enlargement Right ventricular hypertrophy and enlargement  
Intraventricular conduction delays -Left anterior fascicular block Left posterior fascicular block  
Left bundle branch block - Right bundle branch block

**UNIT 2**

**24 Periods**

Myocardial ischemia and infarction Repolarization (ST-Twave) abnormalities QRS changes  
Evolution of electrocardiographic changes -Localization of ischemia or infarction Non-infarction  
Q waves - Primary and secondary T wave change Electrolyte and metabolic ECG abnormalities

**UNIT 3**

**24 Periods**

Cardiac arrhythmias Ventricular premature beats Supra-ventricular tachycardias Atrial  
flutter/fibrillation Ventricular Tachycardia/Ventricular fibrillation

**UNIT 4**

**24 Periods**

Atrio Ventricular block Prolonged PR interval -Mobitz type 1 and 2 block

**UNIT 5**

**24 Periods**

Complete heart block Direct Current (DC) shock Defibrillator  
Monophasic and biphasic shock Technique of cardioversion Indications for cardioversion

**L=120 Periods**

**REFERENCE BOOKS**

C. Colin Schamroth, Introduction to Electrocardiography, Wiley-Blackwell, 7<sup>th</sup> edition, 1990.

## CVT 202 EXERCISE ECG

| L | T | P | C |
|---|---|---|---|
| 8 | 0 | 0 | 8 |

**Objective:** To teach the principles of noninvasive procedures like echocardiography, treadmill and Holter testing

**Outcome:** To train the student to perform noninvasive procedures like echocardiography, treadmill and Holter testing under supervision of cardiologist and assist the cardiologist in cardiac catheterization laboratory under supervision.

### **UNIT 1** **24 Periods**

Equipments / Types of Exercise ECG  
Indication / Contradiction

### **UNIT 2** **24 Periods**

Lead Placement – Rationale, Limitation  
Monitoring during Ex. ECG: Clinical / ECG / Parameters

### **UNIT 3** **24 Periods**

Exercise ECG Protocol: Indications / Advantage and Disadvantage  
Exercise Physiology

### **UNIT 4** **24 Periods**

Exercise ECG: Preparation of Patient / Equipment / Defibrillators,  
Emergency Drugs

### **UNIT 5** **24 Periods**

Exercise ECG: Detection of Various Arrhythmias, Ischemia, and Plan of action  
Exercise ECG: Endpoints: Recognition and Action

**L=120 Periods**

### **REFERENCE BOOKS**

ECG – Clinical electrocardiography – 7th Edition by Ary L Goldberger.



## CVT 203 ECHO & HOLTER RECORDING

| L | T | P | C |
|---|---|---|---|
| 8 | 0 | 0 | 8 |

**Objective:** To understand the principles noninvasive procedures like treadmill and Holter testing

**Outcome:** To train the student to perform noninvasive procedures like treadmill and Holter testing under supervision of cardiologist and assist the cardiologist in cardiac catheterization laboratory under supervision.

### UNIT 1 PRINCIPLE OF ECHOCARDIOGRAPHY

**24 Periods**

General Principles of Echocardiography.

### UNIT 2 TRANSDUCERS

**24 Periods**

Anatomical Planes for Viewing in Echocardiography

Normal M-Mode Echo Study: Anatomy / Function: Measurements

Normal 2D Echo Study: Anatomy / Function: Measurements.

### UNIT 3

**24 Periods**

Echo for Cardiac Function- systolic and diastolic

Echo in Heart Disease: Acquired

Echo in Heart Disease: Congenital

Contrast Echocardiography: Technique and Indications

Transesophageal echocardiography

### UNIT 4

**24 Periods**

Echo Cardiography: Technician's Role:

Hand held Echo users

Vascular Doppler probes.

Twine Doppler and Strain gauge echo

### UNIT 5

**24 Periods**

HOLTER RECORDING-Principles of Holter, Utility and indications, Analysis of Holter

**L=120 Periods**

## EC2905-BIOMATERIALS AND ARTIFICIAL ORGANS

**L T P C**  
**3 0 0 3**

### **Objectives:**

1. To understand the properties of the Bio-compatible materials
2. To study the different types of Biomaterials
3. To study artificial organs made using tissue materials.

### **Outcomes:** Completion of the course will enable the students:

1. To study the characteristics and classification of Biomaterials
2. To study the artificial organ developed using these materials
3. To learn about polymeric materials and combinations that could be used as a tissue replacement implants

### **UNIT I INTRODUCTION TO MATERIALS**

**9 Periods**

Definition and classification of biomaterials - Mechanical Properties, Surface and Physical Properties of Biomaterials, Classes of materials used: Polymers, metals, ceramics and composite as biomaterials for implantation.

### **UNIT II BIOCOMPATIBILITY**

**9 Periods**

Introduction-Wound Healing and foreign Body response, Biomaterials testing, In-Vitro and In-Vivo assessment of tissue compatibility, Methods of test for biological performance, Degradation effects on Metals.

### **UNIT III POLYMERIC IMPLANT MATERIALS**

**9 Periods**

Polymerisation- Synthesis, Mechanical & Thermal properties, Polymeric Biomaterials- polyacrylic acid, Polyacrylamide, Biodegradable Polymers, Medical fibers and Biotextiles- In vitro Applications. Polymers- Medical applications

### **UNIT IV ARTIFICIAL ORGANS**

**9 Periods**

Cardiovascular medical devices, Implantable Cardiac Assist devices (artificial heart, cardiac valves), Orthopedic applications- Internal fracture fixation, Joint replacements, Dental Implantation, Bio—electrodes.

### **UNIT V APPLICATIONS OF MATERIALS IN MEDICINE**

**9 Periods**

Skin Substitutes and Burn Dressings, Soft Tissue replacements, Sutures, Bio-medical Sensors and Biosensors

**L = 45 Periods**

## **TEXT BOOKS**

1. J B Park, Biomaterials Science and Engineering, Plenum Press, 1984
2. Buddy D. Ratner, Allan S. Hoffman, , Biomaterials Science - Introduction to Materials in Medicine

## **REFERENCE BOOKS**

1. Jonathan Black, Biological Performance of materials, Marcel Decker, 1981.
2. Piskin and A S Hoffmann, Polymeric Biomaterials (Eds), Martinus, Nijhoff Publishers. (Dordrecht) 1986.
3. Eugene D. Goldberg, Biomedical Polymers, Akio Nakajima.
4. A.Rembaum & M. Shen, Biomedical Polymers, Mercer Dekkar Inc. 1971.
5. Lawrence Stark & GyanAgarwal, Biomaterials.
6. L.Hench & E. C. Ethridge, Biomaterials – An Interfacial approach.

### CVT 231 Basics of ECG Practical

L T P C  
0 0 3 2

**Objective:** To train the students on the various factors affecting ECG

**List of Exercises:**

- a) Atrial enlargement
- b) Ventricular enlargement & hypertrophy
- c) Intraventricular conduction delays
- d) ECG changes in myocardial ischemia & infarction
- e) Electrolyte & metabolic ECG abnormalities
- f) Cardiac arrhythmias
- g) Cardioversion

**P=45 Periods**

### CVT 232 Exercise ECG Practical

L T P C  
0 0 3 2

**Objective:** To train the students in studying of ECG under various conditions

**List of Exercises:**

- a) Exercise protocols
- b) Patient preparation & lead placement
- c) ST segment & T wave changes with Ex ECG
- d) Cardiac arrhythmias & conduction disturbances during Ex ECG
- e) Emergencies in Stress Testing Lab

**P=45 Periods**

### CVT 233 ECHO and HOLTER recording Practical

L T P C  
0 0 3 2

**Objective:** To give a complete practical training on ECHO and HOLTER

**List of Exercises:**

**Echocardiogram**

- a) M-mode, 2D, Color Doppler, PW & CW Doppler
- b) Evaluation of systolic & diastolic LV function
- c) Assessment of valvular heart disease
- d) Prosthetic valve assessment
- e) Cardiomyopathies
- f) Pericardial diseases

- g) Congenital heart diseases
- h) Cardiac masses
- i) Transesophageal Echocardiography

**Holter Recording**

- a) Connecting the Holter recorder
- b) Holter Analysis

**P=45 Periods**

## CVT 301 CARDIAC CATHETERIZATION BASICS

| L | T | P | C |
|---|---|---|---|
| 8 | 0 | 0 | 8 |

**Objective:** To impart knowledge in the basics in cardiac catheterization laboratory

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

### UNIT 1

**24 Periods**

Cardiac Catheterisation: Laboratory Setup / Types of Procedures - Sterile Techniques in Cath Lab / Sterile Areas, Sterile Procedure, sterile trolley setting, Scrubbing, gowns and Gloves, scrubbing and draping Patients, handling steriledisposables etc. -Sterilisation and re-use of hardware

### UNIT 2

**24 Periods**

Equipments: Cath-Lab Equipments: Defibrillator / Pacemaker / IABP / BOYLE'S-Apparatus / Suction Machine/oxygen Infusion Pumps / Programmed Stimulators, Pacing-System Analysers

### UNIT 3

**24 Periods**

Equipments in Cath-Lab - Hemodynamic Recorders (Physiological Records) -Transducers - Recording of Pressure Wave Form:Range / Gain / Speed / Systolic / Diastolic And Mean Pressures In Chambers And Vessels

### UNIT 4

**24 Periods**

Hazard Management -Radiation Protection Infection Prevention Injury Prevention: Electrical / Mechanical Wastes Management - Plastics -Biological Wastes- Glass / Needle / Syringes

### UNIT 5

**24 Periods**

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) - Equipment Maintenance-Cine Angiography: Cine Filming, Cine Film Processing and Cine Film Viewing, cine film library, Contrast Media

### REFERENCE BOOKS

*Grossman & Baim's Cardiac Catheterization, Angiography, and Intervention, Wolters Kluwer; 8th Revised edition, 2013.*

## CVT 302 CARDIAC CATHETERIZATION – II

| L | T | P | C |
|---|---|---|---|
| 8 | 0 | 0 | 8 |

**Objective:** To impart knowledge on the invasive and noninvasive procedures

**Outcome:** After completion of the course, the student will be in a position to assist the cardiologist in invasive or non invasive cardiac laboratory, in performing routine cardiac investigations and interventional procedures.

### UNIT 1

**16 Periods**

Cardiac Catheterization Procedure: Diagnostic Studies. Cardiac Catheterization Procedure: 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

### UNIT 2

**16 Periods**

Cardiac Catheterization Hardware: Catheters / Connections / Sheaths /

Stopcocks / Wires / Angioplasty Catheters Complication of Cardiac Catheterization: Recognition and management Cardiopulmonary Resuscitation

### UNIT 3

**16 Periods**

Special Procedures: Pericardial Tap Atrial Septostomy Endomyocardial Biopsy

Balloon Angioplasty (Valve) Coronary Angioplasty

Case Study of Simple Cardiac Disease- ASD, MS, Tetralogy of Fallot

### UNIT 4

**24 Periods**

Hardware of Cardiac Catheterization and Interventions

Venous and Arterial Check Flow Sheaths, Manifolds, 3-Way Stock Cocks etc.

Guide Wires and Dilators

Puncture Needles (Vascular Access Needles)

Woven Dacron Catheters: 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 Length, Exchange Length 'J' Tipped Movable Core, Tips, Deflectable Types  
Valvuloplasty Catheters, Atrial Septostomy Catheters

**UNIT 5**

**16 Periods**

Coronary Angioplasty: Guide Catheters, Guide Wire, Balloon Dilatation Catheters, Indiflators, Y Connectors o Stents: Bare Stents, Mounted Stents, Other Types of Stents – Newer generation stents and scaffolds

**UNIT 6**

**16 Periods**

Interventional Cardiology Optical coherence Tomography  
IVUS, Rotablation, TAVI-Peripheral interventions – Silver Hawk & Turbo Hawk

**UNIT 7**

**16 Periods**

Nuclear cardiology-Fundamentals of radiation and types- $\alpha$ ,  $\beta$  &  $\gamma$   
Isotopes (Gamma camera) SPECT & STRESS SPECT PET & Functional assessment.

**L=120 Periods**

**REFERENCE BOOKS**

*Grossman & Baim's Cardiac Catheterization, Angiography, and Intervention*, Wolters Kluwer; 8th Revised edition, 2013.



**CVT 303 CARDIAC CATHETERIZATION III  
PACING AND ELECTROPHYSIOLOGY**

| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|----------|----------|----------|----------|
| <b>8</b> | <b>0</b> | <b>0</b> | <b>8</b> |

**Objective:** To give in depth knowledge on Pacing and electrophysiology

**Outcome:** After completion of the course, the student will be able to assist the cardiologist in invasive or non invasive cardiac laboratory, in performing routine cardiac investigations and interventional procedures.

**UNIT 1**

**30 Periods**

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

**UNIT 2**

**30 Periods**

Pacemaker Clinic: Management of Pacemaker Patients programmers - Intracardiac Electrogram – Technique -Intracardiac Electrogram – Analysis, Intervals etc.

**UNIT 3**

**30 Periods**

Electrophysiological Studies - Radio Frequency Ablation for Arrhythmia's - Implantable Cardioverter Defibrillator -3 D mapping and arrhythmias CARTO & ENSITE -Principles, uses and indications

**UNIT 4**

**30 Periods**

Cardiac Arrest -Cardio Respirator Resuscitation -Hypotension / Hypertensive Crisis -Cardiac tamponade -Anaphylaxis -Emer gency Drugs -Intra-aortic Balloon Pump -Records Keeping: Indents, Stocks, Log Books, Procedure Books etc

**L=120 Periods**

**REFERENCE BOOKS:**

1. Clinical Electrophysiology: Electrotherapy and Electro physiologic Testing Hardcover -1995 by Andrew J. Robinson
2. Essential Concepts Of Electrophysiology And Pacing Through Case Studies- Edited by Kenneth A. Ellenbogen, MD -2014

## PHC103 HOSPITAL AND PATIENT RELATION MANAGEMENT

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

| Objectives   | Outcomes  |
|--|---|
| The objectives of the course are as follows:   | After completion of the course, the students would have   |
| To provide the introduction to the patient centric management.   | Understood the concept of patient centric management.   |
| To provide the concepts of quality and its relation to patient care  | Understood the concept of quality, its tools, relation and application to patient care.                           |
| To provide the understanding of patient classification system  | Understood the patient classification system  |
| To provide importance of medical ethics and auditory procedures in hospitals   | Gained knowledge on the importance of medical ethics and auditory procedures in hospitals                         |
| To provide the information about patient medical records, its management and disaster preparedness procedures in hospitals | Gained clear picture on patient medical records, its management and disaster preparedness procedures in hospitals |

### UNIT I PATIENT CETRIC MANAGEMENT

**9 Periods**

Concept of patient care, patient-centric management, organization of hospital departments, roles of departments/managers in enhancing care, patient counselling and practical examples of patient centric management in hospitals; patient safety and patient risk management.

### UNIT II QUALITY IN PATIENT CARE MANAGEMENT

**9 Periods**

Defining quality, systems approach towards quality, towards a quality framework, key theories and concepts, models for quality improvement and variations in practice.

### UNIT III PATIENT CLASSIFICATION SYSTEMS AND THE ROLE OF CASE MIX

**9 Periods**

Why do we need to classify patients, types of patients classification systems, ICD 9 (CM, PM), case mix classification systems, DRG, HBG, ARDRG, case mix innovations and patient empowering classification systems.

### UNIT IV MEDICAL ETHICS AUDITORY PROCEDURES

**9 Periods**

Ethical principles, civic rights, consumer protection act, CPA, patient complaints powers and procedures of the district forum, state and national commission, role of supreme court, patient appeals, autopsy, tort liability, vicarious liability, medical negligence, central and state laws, use of investigational drugs, introduction / need and procedures for medical audit, audit

administration and regulating committees. Confidentiality and professional secrecy, ethics of trust and ethics of rights-autonomy and informant consent, under trading of patient rights-universal accessibility-equity and social justice, human dignity.

#### **UNIT V PATIENT MEDICAL RECORDS AND DISASTER PREPAREDNESS 9 Periods**

Policies & procedures for maintaining medical records E-records, legal aspects of medical records, its safety, preservation and storage, policies & procedures for general safety; fire safety procedure for evacuation; disaster plan and crisis management.

**L=45 Periods**

#### **REFERENCES:**

1. Goel S L & Kumar R, 2004, Hospital Core Services: Hospital Administration of the 21<sup>st</sup> century, Deep Deep Publications Pvt. Ltd. New Delhi.
2. Gupta S & Kant S. 1998, Hospital & Health Care Administration: Appraisal and Referral Treatise, Jaypee: New Delhi.
3. Harris M G & Assoc. 2003, Managing Health Service: Concepts & Practices. MacLennan+Petty:Sydney.
4. Kelly D L. 2006, Encyclopaedia of Quality Management in Hospitals & Health Care Administration, Vol.1-6, Pentagon Press: Chicago.

### CVT 331-CARDIAC CATHETERISATION BASICS PART 1 PRACTICAL

L T P C  
0 0 3 2

**Objective:** To train the students to acquire practical skills on the technical processes associated with basics of cardiac catheterization

**List of Exercises:**

- a) Catheters & Wires
- b) Intra-cardiac pressures
- c) Cardiac output measurement
- d) Shunt calculations
- e) Coronary angiography
- f) Angiographic views
- g) Ventriculo angiographic views
- h) Right Heart Study

**P=45 Periods**

### CVT 332 CARDIAC CATHETERISATION BASICS PART 2 PRACTICAL

L T P C  
0 0 3 2

**Objective:** To train the students to acquire practical skills on the technical processes associated with basics of cardiac catheterization.

**List of Exercises:**

- a) Aortic & peripheral angiography
- b) Contrast agents used in angiography
- c) Coronary angioplasty
- d) Pediatric interventions
- e) Balloon mitral valvuloplasty

**P=45 Periods**

### CVT 333 CARDIAC CATHETERISATION BASICS PART 3 PRACTICAL

L T P C  
0 0 3 2

**Objective:** To train the students to acquire practical skills on the technical processes associated with basics of cardiac catheterization.

**List of Exercises:**

- a) Peripheral interventions
- b) IABP
- c) Thrombo-embolic disease
- d) Cardiac pacing
- e) Cardiac Electrophysiology & radio frequency ablation

**P=45 Periods**