SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH
(A Deemed to be University Declared under Section 3 of UGC Act, 1956)
Comprising Sri Devaraj Urs Medical College
[Constituent Unit of Sri Devaraj Urs Educational Trust for Backward Classes (Regd.)]
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**(With effect from 2019-20 batches)**

# Choice Based Credit System Based GraduateCurriculum for Bachelor of Science in Cardiac Perfusion Technology

Dean
Faculty of Allied Health Sciences
Sri Devaraj Urs Academy of
Higher Education & Research
Tamaka, Kolar-563 101

Based on Approval BOM-41-2016,(Resolution No-XLI-05(3)/16) Dated-19/10/2016 Adopted during commencement

# REGULATIONS GOVERNING THE BACHELOR OF SCIENCE (B.Sc.) DEGREE UNDER CHOICE BASED CREDIT SYSTEM

2016

**SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION & RESEARCH**
**(Declared as Deemed - to - be University u/s 3 of the UGC Act**
**TAMAKA, KOLAR – 563 101. KARNATAKA, INDIA.**
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**Website: www.sduu.ac.in**

# REGULATIONS GOVERNING

## THE BACHELOR OF SCIENCE (B.Sc.)

## DEGREE

## UNDER CHOICE BASED CREDIT SYSTEM

## 2016

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# REGULATIONS GOVERNING THE DEGREE OF BACHELOR OF SCIENCE (B.Sc.)

# CHOICE BASED CREDIT SYSTEM IN ALLIED HEALTH SCIENCES

## INTRODUCTION

The University Grants Commission has brought in numerous measures to enhance equity, efficiency and excellence in the higher education system in the country. Consequently, has set considerable effectiveness with noticeable improvements in higher education system. Even though, there existed diversity in the evaluation system in Universities in India and to mitigate tremendous diversity adapted in Universities, UGC issued circular D.O.No. F.1-2/2008 (XI Plan) dated March 2009 and further in its circular D.O.No.F-1-1/2014 dated 12th November 2014 has directed all the Universities in the country to implement the Choice Based Credit system (CBCS) scheme to all the undergraduate and post graduate level degrees Programs mandatorily.

In compliance to the above, Sri Devaraj Urs Academy of Higher Education and research [SDUAHER] has notified with vide No SDUAHER/KLR/ADMN/2063/16-17 dated 20.10.16 and introduced CBCS for undergraduate Programs (B.Sc.) in order to achieve academic excellence, quality improvement and as administrative reforms. Based on this background, SDUAHER has framed REGULATION governing B.Sc. Programs under Faculty of Allied Health Sciences.

This facilitates flexible learning; multifaceted development of students with wide variety of courses viz core, electives in discipline specific, Ability enhancement and open to enhance their knowledge and skills. This qualitative change in the Programs is to the global requirements and aspiration of students and stake holders for mobility both within and across the geographical jurisdiction.

CBCS implementation brings desired uniformity in grading system and method for computing semester grade point average (SGPA) for semester performance and cumulative Grade Point average (CGPA) for overall program performance of students in the examinations.

## DEFINITIONS OF KEY WORDS

Applicable to undergraduate, postgraduate level degree, diploma and certificate Programs under the choice based credit system in semester scheme.

**1. University:** Sri Devaraj Urs Academy of Higher Education and Research Tamaka, Kolar

2. **Academic Year** consists of two consecutive semesters a) Even semester (scheduled from January to June) b) Odd semester (scheduled between July to December).

3. S**emester:** Each semester will consists of 15-18 weeks of academic work equivalent to 90 actual teaching days.

4. **Choice Based Credit System (CBCS):** Provides choice for students to select from the prescribed courses/papers such as core, elective or minor or soft skill courses offered in a Program.

5. **Credit Based Semester System (CBSS):** Under the CBSS, the requirement for awarding a degree or diploma or certificate is prescribed in terms of number of credits to be completed by the students.

6. **Program:** An educational program leading to award of a Degree, diploma or certificate.

7. **Course** usually referred to as 'papers' is a component of a program. *All courses May not carry the same weight.* The courses should define learning objectives and Learning outcomes. A course may be designed to comprise lectures/ tutorials/laboratory Work/ field work/ outreach activities/ project work/ vocational training/viva/ seminars/ term papers/assignments/ presentations/ self-study etc. or a combination of some of these.

8. **Branch:** Specialization or discipline of B.Sc. Degree Programs are like Medical Laboratory technology, Imaging technology, optometry, renal dialysis technology, operation theater technology, radiotherapy technology etc.

9. **Letter Grade:** It is an index of the performance of students in a said course. Grades are denoted by letters O, A+, A, B+, B, C, P, F and Ab

10. **Grade Point**: It is a numerical weight allotted to each letter grade on a 10-point scale

11. **Credit:** Each course shall carry certain number of credits. Credits normally represent the weightage of a course and are a function of teaching, learning and evaluation strategies such as number of contact hours, the course content, teaching methodology, learning expectations, etc. In the proposed Programs, credit is a unit by which course work is measured. Credit determines the number of hours of instructions required per week, generally, one credit is equivalent to one hour of teaching [lecture or tutorial] or 2 hours of practical work /field work per week.

12. **Credit Point:** It is the product of grade point and number of credits for a course.

13. **Semester Grade Point Average (SGPA):** It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester.
It shall be expressed up to two decimal places.

14. **Cumulative Grade Point Average (CGPA):** It is a measure of overall cumulative Performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

15**. First Attempt**: A student who has completed all formalities of the semester becomes eligible to attend the examinations and has passed in first sitting; such attempt shall be treated as first attempt.

16 **Transcript or Grade Card or Certificate:** Based on the grades earned, a grade Certificate shall be issued to all the registered students after every semester. The grade Certificate will display the course details (code, title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester.

**B.Sc. PROGRAMS STRUCTURE**

| Semester | Program structure |
|---|---|
| I | Basic medical sciences Common to all disciplines as mandatory core courses (CC),<br>Compulsory foundation course (FC)<br>Discipline specific elective (DSE) |
| II | Basic medical sciences Common to all disciplines as mandatory core courses (CC),<br>Compulsory foundation course (FC)<br>Discipline specific elective (DSE)<br>Ability enhancement course (AEC) |
| III | Core courses discipline wise (CCD)<br>Skill enhancement course (SEC) |
| IV | Core courses discipline wise<br>Ability enhancement course (AEC) |
| V | Core courses discipline wise (CCD)<br>Skill enhancement course(SEC) |
| VI | Core courses discipline wise (CCD)<br>Ability enhancement course (AEC) |
| VII | Internship |

In CBCS, UG degree Programs offered in University are structured to have 7 semesters will have credits in the range of 20 to 26 an average of 23 credits per semester and a total of around 120-156 credits per under graduate program.

## STRUCTURE OF B.Sc. PROGRAMS UNDER CBCS SCHEME

| Semester | Core courses (1-19) | Discipline specific elective (DSE) | Ability enhancement Compulsory Course (AEC) | Skill enhancement courses (SEC) | Open elective (OE) | Foundation course |
|---|---|---|---|---|---|---|
| I | Paper 1<br>Paper 2<br>Paper 3<br>Paper 4 | DSE-1<br>DSE-2<br>DSE-3<br>DSE-4 | - | - | - | Basic Computer Application |
| II | Paper-1<br>Paper 2<br>Paper 3 | DSE-1<br>DSE-2<br>DSE-3<br>DSE-4<br>DSE-5<br>DSE-6 | Environmental science | - | - | English communication |
| III | Paper-1<br>Paper 2<br>Paper 3 | - | - | SEC-1<br>(SAFE-I) | - | - |
| IV | Paper 1<br>Paper 2<br>Paper 3 | - | Constitution of India | - | - | - |
| V | Paper 1<br>Paper 2<br>Paper 3 | - | - | SEC-2<br>Medical Ethics | | - |
| VI | Paper 1<br>Paper 2<br>Paper 3 | - | Quality control | - | - | - |
| VII | Internship | | | | | |

**Types of courses**. 3 types, such as core, elective and foundation

**Core courses:** This is the course/paper which is to be compulsorily studied by a student as a core requirement to complete the requirement of a program in a said discipline of study.

**Foundation Course:** 2 kinds:
1**. Compulsory Foundation courses**: mandatory to all disciplines, which based upon the content that leads to Knowledge enhancement.
2. **Elective foundation courses**: are value-based and are aimed at man-making education.

Elective courses:
This can be chosen from a pool of electives listed in University. It is expected to Support to the discipline of study, provide an expanded scope, enable an exposure to some other discipline/domain and nurture student's proficiency/skill.
An elective may be "Discipline centric" or may be chosen from an unrelated discipline. It may be called an "Open Elective."

**3. CREDIT STRUCTURE FOR COURSE**
Example : SEMESTER-I

| courses | Lectures hours /week In a semester | Tutorials hours /week in a semester | Lab work hours /week in a semester | credits | Total credits |
|---|---|---|---|---|---|
| Course-I | 02 | 01 | 02 | 2:1:1 | 04 |
| Course-II | 02 | 01 | 02 | 2:1:1 | 04 |
| Course-III | 02 | 01 | 02 | 2:1:1 | 04 |
| Course-IV | 02 | 01 | 02 | 2:1:1 | 04 |
| Compulsory Foundation course | 02 | - | 02 | 2:0:1 | 03 |
| Discipline specific Elective | 01 | - | - | 0:0:1 | 01 |
| | | | | Total | 20 |

Course-1 Anatomy paper-1
Course-II anatomy paper 2
Course-III Physiology paper1
Course-IV Physiology paper2
Compulsory foundation course: Basics in computer applications
Discipline Specific electives (anatomy histological techniques and Physiology PFT and ECG)

## REGULATIONS GOVERNING THE DEGREE OF B.Sc. PROGRAMS AS PER CHOICE BASED CREDIT SYSTEM UNDER THE FACULTY OF ALLIED HEALTH SCIENCES

### 1. TITLE

The undergraduate programs known as Bachelor of Science abbreviated as B.Sc.

B. Sc. Programs are as under

- Bachelor of science in Medical laboratory Technology
- Bachelor of science in Imaging Technology
- Bachelor of Science in Optometry
- Bachelor of Science in operation Theater Technology
- Bachelor of Science in Renal Dialysis technology
- Bachelor of Science in Radiotherapy Technology

### 2. DURATIONS

The duration of the under graduate Programs shall be three and half years consists of 7 semesters including internship.

### 3. CALENDAR OF EVENTS

The calendar of events in respect of each program of study shall be fixed by the University from time to time. The examination in all programs of study shall be conducted at the end of each semester.

### 4 ELIGIBILITY FOR ADMISSION

A Candidate seeking admission to B.Sc. program

Shall have passed two years Pre University examination conducted by the pre University board of Karnataka state, with English as one of the subject and physics, chemistry and biology as optional subjects.

OR

Shall have passed any other examination conducted by Boards/councils/intermediate examination established by state Government/central Government and recognized as equivalent to two year pre University examination by the Rajiv Gandhi University of health sciences/Association of Indian Universities (AIU) , with English as one of the subjects and physics, chemistry and biology as optional subjects and the candidate shall have passed subjects of English, physics, chemistry and biology individually.

OR

Shall have passed intermediate examination in science of an Indian university/ Boards/council or other recognized examining bodies with physics ,chemistry and biology which shall include a practical test in these subjects and also English as compulsory subject.
the candidate shall have passed subjects of English, physics, chemistry and biology individually.

OR

Candidates with regular three years diploma in respective discipline recognized by Rajiv Gandhi University of health sciences

OR

The minimum marks for the purpose of eligibility shall be forty percent (40%) in optional subjects in case of students belonging to SC/ST and OBC students from Karnataka or as decided by the Government of Karnataka. Provided further that, the student shall have studied and passed English as one of the subjects.

Candidates who have completed diploma or vocational course through correspondence shall not be eligible for Bachelor of Science Programs.

## 5 LATERAL ENTRY

Candidates passing diploma in concerned discipline and 10+2 or PUC shall be eligible for Lateral entry i.e. admission to II year / semester –III of the B.Sc. Program. However, this will be entertained only if vacancies are available. Applicants should possess minimum of 45 % aggregate marks in PUC (PCMB).

## 6 ATTENDANCES

Each course comprising theory & Practical and tutorials shall be treated as single unit for the purpose of calculation of attendance. A student shall have to attend a minimum of 75% attendance of the total instruction hours in a course (theory/practical/tutorials) in each semester from the date of commencement of the semester to last working day as notified by the University.

The students shall be informed about their attendance status periodically by the department of Allied health sciences. So that, the students shall be cautioned to make up the shortage. The Department of Allied Health sciences shall submit the list of students who have been eligible to appear examinations and list of detained students due to shortage of attendance by the end of the semester to the Controller of Examinations.

Students lacking in the prescribed attendance and progress in any subject(s) in theory and practical should not be permitted to appear for the examination. Such student shall repeat the course in which he/she is deficient with attendance.

## 7. MAXIMUM PERIOD FOR COMPLETION OF THE PROGRAMS

The candidate shall complete the program generally within the twice the number of years of the program from the date of commencement of the program i.e. within six years from the date of admission. If the candidate fails to complete the program with in the period permitted he/she will be discharged from the University. However, fee to be paid for repeating the semesters.

**8**. **MEDIUM OF INSTRUCTION:** The medium of instruction shall be English.

## 9. TEMPORARY DISCONTINUATION OF THE PROGRAM

A student, who wishes to temporarily discontinue the program and continue the same subsequently, has to obtain prior permission from the University by applying through the head of the department. Such students have to take readmission to the same semester/year in the subsequent session. However, the student shall complete the course as per the maximum period fixed by the University

## 10. HOURS OF INSTRUCTION PER WEEK

These number of hours of instruction for each course is defined which includes lectures, tutorials, practical and assignments, as specified to individual courses.

## 11. COURSE PATTERN

The number of credits per semester may vary from 20 to 26, an average of 23 credits per semester and a total of around 120-153 credits for the program. Generally 1 credit per hour of instruction in theory and 1 credit for 2 hours of practical or project work or internship per week.

The courses offered in a program are divided in to core, foundation, and elective courses. The program patterned indicating hours of instruction in all semesters defined under section -3

## 12. THE SCHEME OF EXAMINATION

There shall be examinations at the end of each semester as per the calendar of events notified by the university.

## 13. INTERNAL ASSESSMENT

Regular internal assessment examinations should be conducted on each course in a semester.
There should be a minimum of at least 03 internal assessments examinations in each semester, the number of examination on each course is left to the department. An average of the best two internal assessment examinations should be taken in to consideration during calculation of marks of internal assessment.

The weightage given to the internal assessment is 20% out of the total marks assigned to the course.
Student must secure at least 35% of total marks fixed for internal assessment examination of that course to be eligible to appear for the examination

## 14. REGISTERING FOR THE EXAMINATIONS

Candidate to be eligible to appear for University examination, shall have undergone satisfactorily the semester of the study, shall have to obtain 75% attendance in theory and practical/tutorial jointly to become eligible to appear for examination in the subject/course,
Shall secure at least 35% of internal assessment from the total marks fixed for IA in a particular subject in order to become eligible for examination, shall fulfil any other requirement that may be prescribed by the University from time to time.
And shall pass in all the courses of that semester. Such eligible students will be allotted Registration Number.

## 15. VALUATION OF ANSWERSCRIPTS

Each written paper shall be valued by one internal examiner and one external examiner. Each practical examination shall be jointly conducted and evaluated by one internal examiner and one external examiner or two external examiners if there are no internal examiners. But not by two internal examiners. If the difference in marks between two valuations is more than 15% of the maximum marks, the Registrar (Evaluation) or his nominee shall check the entries and the total marks assigned by the two valuers. If there is any mistake in totalling, it shall be rectified. While checking the total, if it is observed that any one or more of the answers is not valued by one of the valuers, the Chairman, BOE shall advise internal members of the Board of Examiners to value that answer. After receiving the marks, the Chairman, BOE shall make the necessary corrections. Despite all these corrections, if the difference between the two valuations is still more than 15%, the Chairman, BOE shall arrange for third valuation by examiners from the approved panel of examiners.

In case of two valuations, the average of the two valuations and if there are three valuations, the average of the nearest two valuations shall be taken for declaring results.

## 16. RESULTS CLASSIFICATION OF SUCCESSFUL CANDIDATES

The results of successful candidates at the end of each semester shall be declared on the basis of Percentage of Aggregate Marks, converted to grade point and alpha – sign grade for each course on the basis of 10 point scale recommended by UGC.
The following table 1 and 2 shows the final results with grade description and grades

**Table 1: Final Result/Grades Description**

| Semester/ Program % of marks | Semester GPA / Program CGPA | Alpha-Sign/ Letter Grade | Result/Class Description |
|---|---|---|---|
| 90.0-100 | 9.00-10.00 | O (Outstanding) | Outstanding |
| 80.0-<90.0 | 8.00-<9.00 | A+ (Excellent) | First Class Exemplary |
| 70.0-<80.0 | 7.00-<8.00 | A (Very Good) | First Class Distinction |
| 60.0-<70.0 | 6.00-<7.00 | B+ (Good) | First Class |
| 55.0-<60.0 | 5.50-<6.00 | B (Above Average) | High Second Class |
| 50.0-<55.0 | 5.00-<5.50 | C (Average) | Second Class |
| 40.0-<50.0 | 4.00-<5.00 | P (Pass) | Pass Class |
| Below 40 | Below 4.00 | F (Fail) | Fail/ Reappear |
| Absent | 0 | Ab (Absent) | |

**Table 2 point grading system with letter grade**

| Grade Point | 0 | 0 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| Letter Grade | Ab | F | P | C | B | B+ | A | A+ | O |
| | Absent | Fail | Pass | Average | Above average | Good | Very good | Excellent | Outstanding |

## 17. COMPUTATION OF SEMESTER GRADE POINT AVERAGE (SGPA) AND CUMULATIVE GRADE POINT AVERAGE (CGPA)

### 17.1 Calculation of SGPA

The following procedure to compute the Semester Grade Point Average

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e

$$\textbf{SGPA}\ (Si) = \Sigma\ (Ci \times Gi) / \Sigma Ci$$

where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

Note: Grade point denotes the decimal of percentage of marks scored

**Example for SGPA (20 Credits)**

| Papers/courses | P1 | P2 | P3 | P4 | P5 | Total |
|---|---|---|---|---|---|---|
| Max. marks | 100 | 100 | 100 | 100 | 100 | 500 |
| % Marks Obtained | 77 | 73 | 58 | 76 | 64 | 348 |
| Grade Points Earned (GP) | 7.7 | 7.3 | 5.8 | 7.6 | 6.4 | - |
| Credits for the Course(C) | 4 | 4 | 4 | 4 | 4 | 20 |
| Credit points= GP x C | 31 | 29 | 23 | 30 | 26 | 139 |

Semester Aggregate Marks : 348 / **500 = 69.60 %**

Classification of Result **:** First Class

**Illustration for SGPA**

| Course /Core paper | Credit | Grade letter As per 10 point scale | Grade point As per 10 point scale | Credit point (Credit X Grade point) |
|---|---|---|---|---|
| Course 1 | 04 | A | 7.7 | 4X7.7= 31 |
| Course 2 | 04 | B+ | 7.3 | 4X7.3=29 |
| Course 3 | 04 | B | 5.8 | 4X5.8=23 |
| Course 4 | 04 | O | 7.6 | 4X7.6=30 |
| Course 5 | 04 | C | 6.4 | 4X26.4=26 |
| | **20** | | | **139** |
| | SGPA | 139/20 = 6.95 | | |

The SGPA shall then be computed by dividing the total credit points of all the courses of a semester of the study by the total credits for the semester.

SGPA = Total credit points / Total Credits = 139 / 20 = **6.95**

Semester Alpha Sign Grade: **B**

### 17.2 Calculation of CGPA

The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

$$\textbf{CGPA} = \Sigma(Ci \times Si) / \Sigma Ci$$

where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

**Example for CGPA**

The Cumulative Grade Point Average (CGPA) at the end of the fourth semester shall be calculated as the weighted average of the semester GPW. The CGPA is obtained by dividing the total of GPW of all the four semesters by the total credits for the program.

**ILLUSTRATION I**

| **Semester** | **I** | **II** | **III** | **IV** | **V** | **VI** | **Total** |
|---|---|---|---|---|---|---|---|
| Total Marks per Semester | 500 | 500 | 500 | 500 | 500 | 500 | 3000 |
| Total Marks Secured | 348 | 460 | 466 | 450 | 400 | 400 | 2524 |
| Semester Alpha Sign Grade | B+ | O | O | O | A+ | A+ | - |
| SGPA | 6.95 | 8.0 | 7.77 | 8.5 | 7.0 | 7.0 | - |
| Semester total Credits | 20 | 26 | 24 | 24 | 24 | 24 | 142 |

Aggregate Percentage of Marks = 2524 / 3000 = 84.1 **%**

Classification of Result**: Excellent (First class with exemplary)**

**Illustration for CGPA**

| **Semester 1** | **Semester 2** | **Semester 3** | **Semester 4** | **Semester 5** | **Semester 6** |
|---|---|---|---|---|---|
| Credit 20 | Credit 26 | Credit 24 | Credit 24 | Credit 24 | Credit 24 |
| SGPA 6.95 | SGPA 8.0 | SGPA 7.77 | SGPA 8.5 | SGPA 7.0 | SGPA 7.0 |

$$CGPA = \frac{20(6.95)+26(8.0)+24(7.77)+24(8.5)+24(7.0)+24(7.0)}{\text{Total credits of programme } 142}$$

CGPA = 139+ 208+186.5+ 204+ 168+168 = 1073.50 / 142= 7.56

**CGPA 7.56 A (very good) First class with distinction**

## 18. TRANSCRIPT (SCORE CARD /MARKS SHEET) FORMAT

University will issue a transcript format indicating semester performance in terms of score, grade points, SGPA and CGPA. Where the SGPA and CGPA shall be rounded off to 2 decimal places and reported in the Transcripts.

## 19. MINIMUM FOR A PASS

A candidate shall be declared to have passed the UG, if he/she secures at least a CGPA of 4.0 (Course Alpha-Sign Grade C) in the aggregate of both internal assessment and semester end examination marks put together in each unit such as theory papers / practical / project work / dissertation / viva-voce.

However, candidate has to secure minimum of 35% marks in written theory and practical examination separately and 40% as subject aggregate to be declared as pass. Where the subject has no practical, Viva-voce, internal assessment component, passing criteria is 40%.

## 20. GRACE MARKS

Any student who completes all the courses in a semester, but failed in any one of the course with a shortage of 5 or less than 5 marks, such candidates will be awarded to maximum of 5 grace marks.

## 21. CARRY OVER PROVISION

In the first year, candidates who fail in a first semester examinations may go to the second semesters and take the examinations. But he/she has to complete the first year courses before enters to $2^{nd}$ year $3^{rd}$ semester. However, candidate is allowed to carry subjects of $3^{rd}$ and $4^{th}$ semesters to $5^{th}$ semester. . But before entering for the $6^{th}$ semester, he/she has to complete all the carried subjects along with 5th semester courses. However a carryover provision restricted to the maximum period offered to a candidate for completion of the program as per the clause 7.0

## 22. REVALUATION

There is no revaluation permissible in the regulation

## 23. POWER TO REMOVE DIFFICULTIES:

i) If any difficulty arises in giving effect to the provisions of these regulations, the Vice-Chancellor may by order make such provisions not inconsistent with the Act, Statutes, Ordinances or other Regulations, as appears to be necessary or expedient to remove the difficulty.

ii) Every order made under this rule shall be subject to ratification by the Appropriate University Authorities.

a)

**PREVIEW ONLY, NOT FOR PRINTING**

# GRADE CARD

**SEMESTER - I B.Sc. IMAGING TECHNOLOGY (C.B.C.S)**
**January 2018 Examination**

**Register Number : 17IMT001**

**Student Name : Abhijith K P**
**Father's Name : Pramod K Das**
**Mother's Name : Rekha Pramod**

| Sl. No. | Subject / Paper | | Theory / Practical | | I.A. / Viva | | Total | | Cr. Hrs. | Gr. Pts. | Cr. Pts. | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Max. | Sec. | Max. | Sec. | Max. | Sec. | | | | |
| | **Core Course** | | | | | | | | | | | |
| 01 | **Anatomy-I :** General Anatomy, Histology and Embryology | Th.<br>Pr. | 050<br>020 | 041<br>012 | 025<br>005 | 020<br>003 | 075<br>025 | 061<br>015 | 004 | 7.6 | 30.4 | Pass |
| 02 | **Anatomy-II :** Systemic Histology and Gross Anatomy | Th.<br>Pr. | 050<br>020 | 027<br>013 | 025<br>005 | 020<br>003 | 075<br>025 | 047<br>016 | 004 | 6.3 | 25.2 | Pass |
| 03 | **Physiology-I :** Physiological functions of the body | Th.<br>Pr. | 050<br>020 | 041<br>018 | 025<br>005 | 021<br>005 | 075<br>025 | 062<br>023 | 004 | 8.5 | 34.0 | Pass |
| 04 | **Physiology-II :** Physiology of Hormonal and Regulatory function | Th.<br>Pr. | 050<br>020 | 038<br>017 | 025<br>005 | 021<br>004 | 075<br>025 | 059<br>021 | 004 | 8.0 | 32.0 | Pass |
| | **Foundation Course** | | | | | | | | | | | |
| 05 | Basic Computer Applications | Th.<br>Pr. | 050<br>020 | 023<br>020 | -<br>- | -<br>- | 050<br>020 | 023<br>020 | 003 | 6.1 | 18.4 | Pass |
| | **Discipline Specific Elective** | | | | | | | | | | | |
| 06 | Physiology (ECG) | Th. | 030 | 028 | - | - | 030 | 028 | 001 | 9.3 | 09.3 | Pass |
| | **Grand Total** | | | | | | **500** | **375** | **020** | | **149.4** | |

**S.G.P.A : 7.47** | **Grade : A (Very Good)**

**35% in each Theory and Practical Examination and 40% in Subject aggregate.**
**College / Department : Allied Health Sciences, SDUAHER**

**Name & Signature of verifier**

**Date : 04/04/2018**

**Controller of Examinations**

| Percentage of Marks | SGPA/CGPA | Alpha-Sign/Letter Grade | Result/Class Description |
|---|---|---|---|
| 90.0-100 | 9.00-10.00 | O (Outstanding) | Outstanding |
| 80.0-<90.0 | 8.00-<9.00 | A+ (Excellent) | First Class Exemplary |
| 70.0-<80.0 | 7.00-<8.00 | A (Very Good) | First Class Distinction |
| 60.0-<70.0 | 6.00-<7.00 | B+ (Good) | First Class |
| 55.0-<60.0 | 5.50-<6.00 | B (Above Average) | High Second Class |
| 50.0-<55.0 | 5.00-<5.50 | C (Average) | Second Class |
| 40.0-<50.0 | 4.00-<5.00 | P (Pass) | Pass Class |
| Below 40 | Below 4.00 | F (Fail) | Fail/Reappear |
| Absent | 0 | Ab | |

SDUAHER

# SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH

**( Deemed to be University u/s 3 of the UGC Act, 1956)**

## BACHELOR OF SCIENCE (B.Sc.)

**Cardiac Perfusion Technology**

**2019**

## SYLLABUS UNDER

## CHOICE BASED CREDIT SYSTEM

## LEARNING OBJECTIVES OF CARDIAC PERFUSION TECHNOLOGY

By the end of the course, the student should be able to:

1. Understand the history and development of perfusion technology and cardiopulmonary bypass
2. Describe the basic anatomy of cardiac system, respiratory system, renal system and basic anatomy of other systems.
3. Describe basic biochemical parameters and physiological changes
4. Describe physiologic details of cardiac system
5. Describe basic pathologic disorders related to the cardiac system
6. Identify common drugs used for cardiac conditions
7. Demonstrate knowledge of history of
8. Describe working of a heart- lung machine.
9. Describe basics of perfusion technology
10. Describe recent advances of perfusion technology
11. Demonstrate skills of a perfusion technician and ability to assist in routine, emergency and Complicated cases.

## Structure of B.Sc. Cardiac Perfusion Technology Programme under CBCS scheme

| Semester | Core courses (1-21) | Discipline specific elective (DSE) | Ability enhancement Compulsory Course (AEC) | Skill enhancement courses (SEC) | Open elective (OE) | Foundation course |
|---|---|---|---|---|---|---|
| I | 1&2.Anatomy –I & II<br>3&4.Physiology – I & II | DSE-1<br>DSE-2<br>DSE-3<br>DSE-4 | - | - | - | Basic Computer Application |
| II | 5. Biochemistry<br>6. Microbiology<br>7. Pathology | DSE-1<br>DSE-2<br>DSE-3<br>DSE-4<br>DSE-5<br>DSE-6 | Environmental science | - | - | English communication |
| III | 8.Applied Pathology and Microbiology<br>9. Introduction to Cardiac Perfusion Technology<br>10.Applied Pharmacology<br>11. Medicine relevant to Cardiac Perfusion technology | | | SEC-1 (SAFE-I) | - | - |
| IV | 12.Applied Pathology and Microbiology<br>13. Introduction to Cardiac Perfusion Technology<br>14.Applied Pharmacology<br>15. Medicine relevant to Cardiac Perfusion technology | | Constitution of India | - | - | - |
| V | 16. Cardiac Perfusion Technology –Clinical<br>17. Cardiac Perfusion Technology -Applied<br>18. Cardiac Perfusion Technology -Advance | | | SEC-2 Medical Ethics | - | - |
| VI | 19. Cardiac Perfusion Technology -Clinical<br>20. Cardiac Perfusion Technology -Applied<br>21. Cardiac Perfusion Technology -Advance | - | Quality control | - | - | - |
| VII | Internship | | | | | |

# First semester distribution of hours and credits- CBCS scheme

| Subject | Paper & Code | Subjects | Theory | | Practical | | Tutorials | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | hours | **Credits** | hours | **Credits** | hours | **Credits** | Hours | **Credits** |
| CC-Anatomy | Paper-I A101 | General Anatomy, Histology & Embryology | 30 | **02** | 30 | **01** | 30 | **01** | 90 | **04** |
| | Paper –II A102 | Systemic Histology & Gross anatomy | 30 | **02** | 30 | **01** | 30 | **01** | 90 | **04** |
| CC-Physiology | Paper-I A104 | Physiological functions of the body | 30 | **02** | 30 | **01** | 30 | **01** | 90 | **04** |
| | Paper –II A105 | Physiology of hormonal and regulatory function | 30 | **02** | 30 | **01** | 30 | **01** | 90 | **04** |
| CF-Compulsory foundation course | 1207 | Basic computer application | 30 | **02** | 30 | **01** | - | - | 60 | **03** |
| | | Total | 170 | **11** | 150 | **05** | 120 | **04** | 440 | **19** |
| | A108<br>A109 | Discipline specific electives (DSE) | Anatomy* | 1 Histology Techniques preparation of slides & stains (01 credit)<br>2 Museum preparation (01 credit) | | | | | | **01** |
| | A110 | | Physiology * | 1 ECG (01 credit) | | | | | | |
| | A111 | | | 2 Pulmonary function test (01 credit) | | | | | | |
| | | | | **Grand Total** | | | | | | **20** |

**Note: Each student has to choose any one discipline specific elective (DSE) offered during first semester in the core subject.**

# First semester B.Sc. in Cardiac Perfusion Technology

| Subject | Paper &code | Subject | Theory | Theory IA | Viva voce | Practical | Practical I.A | Grand total | |
|---|---|---|---|---|---|---|---|---|---|
| CC-Anatomy | Paper-I A101 | General Anatomy, Histology & Embryology | 50 | 10 | - | - | - | 60 | UNIVERSITY LEVEL EXAM |
| | Paper –II A102 | Systemic Histology & Gross anatomy | 50 | 10 | - | - | - | 60 | |
| | A103 | Anatomy common Practical | - | - | 30 | 40 | 10 | 80 | |
| CC-Physiology | Paper-I A104 | Physiological functions of the body | 50 | 10 | - | - | - | 60 | |
| | Paper –II A105 | Physiology of hormonal and regulatory function | 50 | 10 | - | - | - | 60 | |
| | A106 | Physiology common Practical | - | - | 30 | 40 | 10 | 80 | |
| Compulsory foundation course | A107 | Basic computer application | 50 | - | - | 20 | - | 70 | |
| Discipline specific electives (DSE) | A108 | Histology Techniques preparation of slides & stains | 30 | - | - | - | - | 30 | |
| | A109 | Museum preparation | | | | | | | |
| | A110 | Electrocardiogram (ECG) | | | | | | | |
| | A111 | Pulmonary Function Test (PFT) | | | | | | | |
| | | | 280 | 40 | 60 | 100 | 20 | 500 | |

**Note: Each student has to choose any one discipline specific elective from the University listed DE**

# Second semester distribution of hours and credit- CBCS scheme

| Subject | Paper & Code | Subjects | Theory | | Demonstrations/ assignments | | Tutorials | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | hours | **Credits** | hours | **Credits** | hours | **Credits** | Hours | **Credits** |
| Core course (CC) | Paper-I B101 | Elementary aspects of biochemistry | 40 | **02** | 40 | **01** | 40 | **02** | 160 | **05** |
| | Paper-II B102 | Elementary microbiology. | 40 | **02** | 40 | **01** | 40 | **02** | 160 | **05** |
| | Paper-III B103 | Basics of general ,systemic, clinical, hematology and histopathological technique | 40 | **02** | 40 | **01** | 40 | **02** | 160 | **05** |
| Compulsory foundation Course (FC) | B104 | English for communication | 30 | **02** | | | - | **-** | 30 | **02** |
| Ability enhancement course (AEC) | B105 | Environmental science | 30 | **02** | Field visit- | **01** | - | **-** | 30 | **03** |
| | | Total | 180 | **09** | 240 | **07** | 120 | **03** | 540 | **20** |
| Discipline specific electives (DE) | B106<br>B107 | Biochemistry* | | 1 Basic aspects of research (01) credit<br>2 Sample collection, preservation and transportation (01 credit) | | | | | | **01** |
| | B108<br>B109<br>B110 | Microbiology* | | 1. Sterilization and disinfection (01 credit)<br>2. Antibiotic resistance (01 credit)<br>3. Specimen collection and transportation (01 credit) | | | | | | |
| | B111<br>B112 | Pathology* | | 1.Phlebotomy (01 credit)<br>2. Museum Technology (01credit) | | | | | | |
| | | | | **Grand Total** | | | | | | **21** |

Note: choose any one elective from DSE during second semester in the subject *

# Second semester B.Sc. in Cardiac Perfusion Technology

| Subject | Paper/code | Subjects | Theory | | | | Practical | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory | Viva voce | I.A | Sub total | Practical | I.A | Sub total | Grand total |
| CC Bio chemistry | Paper-I B101 | Elementary aspects of biochemistry | 80 | - | 20 | 100 | - | - | - | 100 |
| CC Micro biology | Paper-I B102 | Elementary microbiology. | 80 | - | 20 | 100 | - | - | - | 100 |
| CC Pathology | Paper –I B103 | Basics of general ,systemic, clinical, hematology and histopathological technique | 80 | - | 20 | 100 | - | - | - | 100 |
| Compulsory foundation course (CF) | B104 | English for communication | 50 | - | - | 50 | | - | - | 50 |
| Ability enhancement course (AEC) | B105 | Environmental science- | 60- | -- | 20 | 80 | -- | - | - | 80 |
| Discipline specific electives (DE) | B106 Biochemistry B107 | 1. Basic aspects of research<br>2.Sample collection, preservation and transportation | 30 | - | - | 30 | - | - | - | 30 |
| | B108 B109 B110 | 1.Sterilization and disinfection<br>2.Antibiotic resistance<br>3.Specimen collection and transportation | | | | | | | | |
| | B111 Pathology B112 | Phlebotomy (01 credit)<br>3.Museum Technology (01credit) | | | | | | | | |
| | | **Total** | **380** | | **80** | **460** | - | - | - | **460** |

**Note: No practical examinations in semester –II Biochemistry, pathology and microbiology**

## Third semester B.Sc. in Cardiac Perfusion Technology distribution of hours and credit-

## CBCS scheme

| Subject | Paper | Subjects | Theory | | Practical | | Demonstrations/ assignments | | Tutorials | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | hours | **Credits** | hours | **Credits** | hours | **Credits** | hours | **Credits** | Hours | **Credits** |
| Core course (CC) | Paper-I C101 | Applied Pathology & Applied Microbiology | 40 | **02** | 40 | **01** | 40 | 01 | 40 | **02** | 160 | **06** |
| | Paper-II C102 | Introduction to Cardiac Perfusion Technology | 40 | **02** | 40 | **01** | 40 | 01 | 40 | **02** | 160 | **06** |
| | Paper-III C103 | Applied Pharmacology | 20 | **01** | - | **-** | - | **-** | 20 | **01** | 40 | **02** |
| | Paper-IV C104 | Medicine Relevant to Cardiac Perfusion Technology | 40 | **02** | - | **-** | 40 | **01** | 20 | **01** | 100 | **04** |
| Skill enhancement course (SEC) | C105 | Skill Enhancement Course *Safe- i* | 30 | **03** | - | **-** | - | - | - | **-** | 30 | **03** |
| | | Total | 170 | **10** | 80 | **02** | 120 | 03 | 120 | **06** | 490 | **21** |

# Third semester B.Sc. in Cardiac Perfusion Technology

| Subject | Paper/code | Subjects | Theory | | | | Practical | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory | Viva voce | I.A | Sub total | Practical | I.A | Sub total | Grand total |
| Core course (CC) | Paper-I C101 | Applied Pathology & Applied Microbiology | 100 | 30 | 20 | 150 | 40 | 10 | 50 | 200 |
| | | Section - A Applied Pathology | 50 | 15 | 10 | 75 | 20 | 5 | 25 | 100 |
| | | Section –B Applied Microbiology | 50 | 15 | 10 | 75 | 20 | 5 | 25 | 100 |
| | Paper-II C102 | Introduction to Cardiac Perfusion Technology | 100 | 30 | 20 | 150 | 40 | 10 | 50 | 200 |
| | Paper-III C103 | Applied Pharmacology | 40 | | 10 | 50 | | | | 50 |
| | Paper-IV C104 | Medicine Relevant to Cardiac Perfusion Technology | 80 | - | 20 | 100 | | | | 100 |
| Skill enhancement course (SEC) | C105 | Skill Enhancement Course *Safe- i* | 50 | - | - | 50 | - | - | - | 50 |
| | | **Total** | **370** | **60** | **70** | **500** | **80** | **20** | **100** | **600** |

## Fourth semester B.Sc. in Cardiac Perfusion Technology distribution of hours and credit-

## CBCS scheme

| Subject | Paper | Subjects | Theory | | Practical | | Demonstrations/ assignments | | Tutorials | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | hours | **Credits** | hours | **Credits** | hours | **Credits** | hours | **Credits** | Hours | **Credits** |
| Core course (CC) | Paper-I D101 | Applied Pathology & Applied Microbiology | 40 | **02** | 40 | **01** | 40 | 01 | 40 | **02** | 160 | **06** |
| | Paper-II D102 | Introduction to Cardiac Perfusion Technology | 40 | **02** | 40 | **01** | 40 | 01 | 40 | **02** | 160 | **06** |
| | Paper-III D103 | Applied Pharmacology | 20 | **01** | - | **-** | - | **-** | 20 | **01** | 40 | **02** |
| | Paper-IV D104 | Medicine Relevant to Cardiac Perfusion Technology | 40 | **02** | - | **-** | 40 | **01** | 20 | **01** | 100 | **04** |
| AECC | D105 | Constitution of India | 30 | **03** | - | **-** | - | - | - | **-** | 30 | **03** |
| | | Total | 170 | **10** | 80 | **02** | 120 | 03 | 120 | **06** | 490 | **21** |

# Fourth semester B.Sc. in Cardiac Perfusion Technology

| Subject | Paper/code | Subjects | Theory | | | | Practical | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory | Viva voce | I.A | Sub total | Practical | I.A | Sub total | Grand total |
| Core course (CC) | Paper-I D101 | Applied Pathology & Applied Microbiology | 100 | 30 | 20 | 150 | 40 | 10 | 50 | 200 |
| | | Section - A Applied Pathology | 50 | 15 | 10 | 75 | 20 | 5 | 25 | 100 |
| | | Section –B Applied Microbiology | 50 | 15 | 10 | 75 | 20 | 5 | 25 | 100 |
| | Paper-II D102 | Introduction to Cardiac Perfusion Technology | 100 | 30 | 20 | 150 | 40 | 10 | 50 | 200 |
| | Paper-III D103 | Applied Pharmacology | 40 | | 10 | 50 | | | | 50 |
| | Paper-IV D104 | Medicine Relevant to Cardiac Perfusion Technology | 80 | - | 20 | 100 | | | | 100 |
| AECC | D105 | Constitution of India | 50 | - | - | 50 | - | - | - | 50 |
| | | **Total** | **370** | **60** | **70** | **500** | **80** | **20** | **100** | **600** |

## Fifth semester B.Sc. in Cardiac Perfusion Technology distribution of hours and credit-

## CBCS scheme

| Subject | Paper | Subjects | Theory | | Practical | | Demonstrations/ assignments | | Tutorials | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | hours | **Credits** | hours | **Credits** | hours | **Credits** | hours | **Credits** | Hours | **Credits** |
| Core course (CC) | Paper-I E101 | Cardiac Perfusion Technology – Clinical | 40 | **02** | 40 | **01** | 40 | **01** | 40 | **02** | 160 | **06** |
| | Paper-II E102 | Cardiac Perfusion Technology – Applied | 40 | **02** | 40 | **01** | 40 | **01** | 40 | **02** | 160 | **06** |
| | Paper-III E103 | Cardiac Perfusion Technology – Advanced | 40 | **02** | 40 | **01** | 40 | **01** | 40 | **02** | 160 | **06** |
| Skill enhancement course (SEC) | E104 | Medical Ethics | 30 | **02** | - | **-** | - | **-** | - | **-** | 30 | **02** |
| | | Total | 150 | **08** | 120 | **03** | 120 | **03** | 120 | **06** | 510 | **20** |

# Fifth semester B.Sc. in Cardiac Perfusion Technology

| Subject | Paper/code | Subjects | Theory | | | | Practical | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory | Viva voce | I.A | Sub total | Practical | I.A | Sub total | Grand total |
| Core course (CC) | Paper-I E101 | Cardiac Perfusion Technology –Clinical | 100 | 30 | 20 | 150 | 40 | 10 | 50 | 200 |
| | Paper-II E102 | Cardiac Perfusion Technology – Applied | 100 | 30 | 20 | 150 | 40 | 10 | 50 | 200 |
| | Paper-III E103 | Cardiac Perfusion Technology – Advanced | 100 | 30 | 20 | 150 | 40 | 10 | 50 | 200 |
| Skill enhancement course (SEC) | E104 | Medical Ethics | 50 | - | - | 50 | - | - | - | 50 |
| | | **Total** | **350** | **90** | **60** | **500** | **120** | **30** | **150** | **650** |

## Sixth semester B.Sc. in Cardiac Perfusion Technology distribution of hours and credit-

## CBCS scheme

| Subject | Paper | Subjects | Theory | | Practical | | Demonstrations/ assignments | | Tutorials | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | hours | **Credits** | hours | **Credits** | hours | **Credits** | hours | **Credits** | Hours | **Credits** |
| Core course (CC) | Paper-I F101 | Cardiac Perfusion Technology – Clinical | 40 | **02** | 40 | **01** | 40 | **01** | 40 | **02** | 160 | **06** |
| | Paper-II F102 | Cardiac Perfusion Technology – Applied | 40 | **02** | 40 | **01** | 40 | **01** | 40 | **02** | 160 | **06** |
| | Paper-III F103 | Cardiac Perfusion Technology – Advanced | 40 | **02** | 40 | **01** | 40 | **01** | 40 | **02** | 160 | **06** |
| Skill enhancement course (SEC) | F104 | Quality control | 30 | **02** | - | **-** | - | **-** | - | **-** | 30 | **02** |
| | | Total | 150 | **08** | 120 | **03** | 120 | **03** | 120 | **06** | 510 | **20** |

# Sixth semester B.Sc. in Cardiac Perfusion Technology

| **Subject** | Paper/code | Subjects | **Theory** | | | | **Practical** | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory | Viva voce | I.A | Sub total | Practical | I.A | Sub total | Grand total |
| Core course (CC) | Paper-I F101 | Cardiac Perfusion Technology –Clinical | 100 | 30 | 20 | 150 | 40 | 10 | 50 | 200 |
| | Paper-II F102 | Cardiac Perfusion Technology – Applied | 100 | 30 | 20 | 150 | 40 | 10 | 50 | 200 |
| | Paper-III F103 | Cardiac Perfusion Technology – Advanced | 100 | 30 | 20 | 150 | 40 | 10 | 50 | 200 |
| Ability enhancement compulsory course | F104 | Quality control | 50 | - | - | 50 | - | - | - | 50 |
| | | **Total** | **350** | **90** | **60** | **500** | **120** | **30** | **150** | **650** |

**SEMESTER-I**
**B.Sc. Allied Health Science Programmes (Cardiac Perfusion Technology)**
**Syllabus**
**Subject: Anatomy**
**Paper-I**
**Paper Title: (General Anatomy, General Histology, General Embryology)**
**Credits (Theory 02, Practical 01)**

**Theory lectures: 30**

**Unit –1**

**Introduction human body as a whole** **08 hours**

Definition of anatomy & its divisions, Terms of location, positions & planes, **Cell** & its organelles, **Basic tissues**- classification with examples, **Epithelium**- definition, classification, describe with examples, functions, **Glands**-classification, describe serous & mucous glands with examples

**Unit-2**

**Locomotion & support** **10 hours**

**Connective Tissue-** components and classification, **Cartilages-** types with example & histology, **Bone**- classification, names of bone cells, parts of long bone, microscopy of compact bone, names of all bones, Vertebral column, Invertebral disc. **Joints**-Classification of joints with examples. **Muscular system**-structure & classfication of muscular tissue. **Nervous System** Neuron, Classification of CNS,

**Unit-3**

**Cardiovascular system** **10 hours**

Heart-Size, Location, Chambers, Exterior & Interior, Blood Supply Of Heart, Pericardium Systemic & Pulmonary Circulation, Branches Of Aorta, Common Carotid, Subclavian , Axillary , Brachial , Femoral and Internal Iliac artery, Portal Vein, Great Saphenous vein, Dural Venous Sinuses. **Lymphatic System** Thoracic duct Lymphoid organs- Primary & secondary, Names of regional Lymphatics, Axillary & Inguinal Lymph nodes

**Unit-4**

**General Embryology** **02 hours**

Spermatogenesis & oogenesis, Ovulation, Fertilization. Placenta.

# PRACTICAL

**Experiments** **(Credits 01 , Hours 30)**

1. Histology of types of epithelium
1. Histology of serous, Mucous & mixed salivary glands
2. Histology of 3 types of cartilages,
3. Demonstration of all bones showing parts, radiographs of normal bones & joints.
4. Histology of compact bone (TS & LS)
5. Histology of skeletal (TS& LS), smooth & cardiac muscle
6. Histology of peripheral nerve
7. Demonstration of heart & vessels in the body,
8. Histology of large, medium sized arteries, & Large vein,
9. Histology of lymph node, Spleen, Tonsil & Thymus
10. Demonstration of embryology models

**Syllabus**
**Subject: Anatomy**
**Paper-II**
**Paper Title: (**Gross Anatomy, Systemic Histology **)**
**Credits (Theory 02, Practical 01)**

**Theory lectures: 30**

**Unit –1**

**Gastro- Intestinal System** **05 hours**

Parts of GIT, Oral Cavity(lip, tongue with histology), Tonsil, Dentition, Pharynx, Salivary glands, Waldeyer's ring, Oesophagus, Stomach, Small & large intestine, Liver, Gall Bladder, Spleen and Pancreas. Thoraco abdominal Diaphragm

**Unit-2**

**Peritoneum** 02 hours

Describe in brief Peritoneal folds

**Unit-3**

**Respiratory System** **03 hours**

Parts of Respiratory system , Nose, Nasal cavity, Larynx, Trachea, Pleura, Lungs, Broncho pulmonary Segments

**Unit-4**

**Urinary System** 03 hours

Gross Anatomy of Kidney, Ureter, Urinary bladder, male & female urethra,

**Unit –5**

**Reproductive System** **04 hours**

**Male reproductive system -** Testis, Vas deferens, epididymis, prostate (gross & histology)
**Female reproductive system-** Uterus, Fallopian tubes, ovary (gross & histology)
Mammary gland- gross

**Unit –6** 04 hours

**Endocrine glands**

Names of all endocrine glands, Pituitary gland, Thyroid gland, Parathyroid gland,Supra renal glands- (gross & Histology)

**Unit –7**

**Neuroanatomy** **04 hours**

Cerebrum, Cerebellum, midbrain, pons, medulla oblongata, Spinal cord with spinal, Nerves, Meninges, Ventricles & cerebrospinal fluid, Names of basal nuclei, Blood supply of brain, Cranial nerves,

**Unit-8**

**Sensory Organs** **05 hours**

**Skin-** Histology, Appendages of Skin **Eye-** Parts of Eye & Lacrimal Apparatus, Extra ocular muscles & nerve supply **Ear-** parts of Ear-External, Middle and inner ear and contents.

## PRACTICAL

**Experiments** **(Credits 01 , Hours 30)**

1. Demonstration of Gastro intestinal system, Histology of GIT
2. Demonstration of part of Respiratory System. Histology of lung & trachea
3. Demonstration of parts of Urinary system, Histology of kidney, Ureter, Urinary bladder
4. Demonstration of section of male & female pelvis with organs in situ, Histology of testis, Vas deferens, epididymis, prostate, Uterus, Fallopian tube, ovary
5. Demonstration of glands, Histology of pituitary Thyroid, Parathyroid, Suprarenal glands
6. Demonstration of all nerve plexus and palpable nerves in the body.
7. Demonstration of all parts of brain. Histology of Optic nerve, Cerebrum, Cerebellum, Spinal cord.
8. Histology of Thin and Thick Skin, Demonstration of eye ball, Histology of Cornea & Retina.

**Reference Books - Anatomy**


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 & applied) Saunder's & C P Prism publishers, Banglore
4. ESTER.M.Grishcimer, physiology & anatomy with practical Considerations J.P. Lippin cott. Philadelphia.
5. Bhatnagar Essentials of Human Embryology –Revised Edition Orient Blackswan Pvt.Ltd.
6. B.D.Chaurasia Human anatomy CBS publishers
7. Patrick W.Tank and Thomas R Gest Atlas of anatomy Lippincot williams and Wilkins
8. Hollinshed Text book of Anatomy Harper and Row Publishers
9. Willium J Larson Human embryology 3rd edition Churchill Living stone
10. Indebir Singh. Human neuro Anatomy Jaypee brothers
11. Halim A Surface and Radiological Anatomy CBS publishers

**SEMESTER-I**
**B.Sc. Allied Health Science Programmes**
**Syllabus**
**Subject: Physiology**
**Paper-I**
**Paper Title: (Physiological functions of the body)**
**Credits (Theory 02, Practical 01)**

**Theory lectures: 30**

**Unit –1**

**Blood** **10 hours**

Composition and functions of blood, Plasma proteins types and function, RBC- formation, function physiological variation, Anemia classification-morphological and etiological effects of anemias on the body, Blood indices –colour index, MCV, MCH, MCHC, ESR normal value PCV normal value, WBC- function, life span, normal value, Immunity, Hemoglobin- functions normal value, Types of Hemoglobin, Jaundice, Platelets morphology normal value and function, Blood groups- basis of blood grouping, clinical importance, blood banking and transfusion, Haemostasis, Definition, normal values of clotting and bleeding time mechanism disorders, Anticoagulants

**Unit-2**

**Renal System** **05 hours**

Structure and function of nephron, types of nephron, classify nephrons. Steps of urine formation, define GFR, GFR normal value, factors affecting GFR. Micturition reflex. Diuretics Water diuresis and osmotic diuresis, define role of kidney in regulation of Blood pressure.

**Unit-3**

**Digestive System** **05 hours**

Basic structure of Digestive system, Composition and functions of Salivary secretion, Gastric secretion, Pancreatic secretion, Intestinal secretion, Bile & Gastro-intestinal movements

**Unit-4**

**Cardiovascular System** **05 hours**

List the Properties of cardiac muscle, conducting system of heart. List the events of Cardiac cycle & Heart sounds. Define Cardiac output and give normal value. Effect of exercise on heart. List the mechanism of Regulation blood pressure. Electrocardiogram-physiological basis and applications. Defined shock signs and symptoms of hypovolemic shock

**Unit-5**

**Respiratory System** **05 hours**

Functional anatomy, Mechanics of normal respiration, functions of surfactants and lung function test, Lung volumes and capacities, definitions of Hypoxia, cyanosis, dyspnea, asphyxia, artificial respiration, partial pressure of oxygen and carbon dioxide in arterial and venous blood.

## PRACTICAL

**Experiments** **(Credits 01 , Hours 30)**

**Hematology Experiments**

1. Estimation of Hemoglobin
2. Bleeding time
3. Clotting time
4. PCV
5. ESR
6. Preparation of Peripheral smear.

**Syllabus**
**Subject: Physiology**
**Paper-II**
**Paper Title: (**Physiology of hormonal and regulatory function)
**Credits (Theory 02, Practical 01)**

**Theory lectures: 30**

**Unit –1**

**Muscle And Nerve Physiology** **02 hours**

Structure and functions of a neuron and neuroglia. Transmission of nerve impulse, Structure and transmission across neuro-muscular junction, Myasthenia gravis, Types of muscle fibers, Rigor mortis

**Unit-2**

**Endocrinology** **09 hours**

Definition, classification of endocrine hormones, Estimation and assessment of Hormones, function of Pituitary hormone, Thyroid hormone, Parathyroid hormone, Adrenal hormone, Pancreatic hormones. List the disease associated with hyper secretion and hypo secretion.

**Unit-3**

**Reproductive System** **05 hours**

**Male reproductive system:** Functions of testis, list the step of Spermatogenesis & factors influencing it. **Female reproductive system:** function of ovary, Ovulation tests, define menstrual cycle, give the average duration, name the hormones influencing menstrual cycle Physiological changes during pregnancy, Pregnancy diagnostic tests. Define contraception. Describe contraceptive methods in males and females.

**Unit-4**

**Central Nervous System** **09 hours**

Organization of nervous system, define synapse, synapse receptor, action potential, list sensory nerves and sensations that carry, list the motor tracts, comment on sensation of spinal cord. Higher functions- memory learning speech, Cerebro spinal fluid formation, composition and functions. Lumbar puncture. Reflex arc, functions of cortex, cerebellum, hypothalamus, basal ganglia. Limbic system- components of anterior nervous system and action of heart.

**Unit-5**

**Special Senses** **05 hours**

List the special senses and their receptor, visual pathway, Colour vision, refractive errors Visual reflexes-pupillary and light reflex. structure of the middle ear and inner ear, Mechanism of hearing, Pathway of taste, primary taste sensations, receptor for smell.

## PRACTICAL

**Experiments** **(Credits 01, Hours 30)**

**Clinical Physiology**

1. Pulse
2. Blood pressure
3. Spirometry
4. Pulmonary function tests
5. Electro Cardio Gram (ECG)
6. General physical examination

**Reference Books Physiology**


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
5. Pal G.K. Text book of Medical physiology Avichal publishing company
6. Campbell FJM Clinical physiology ELBS
7. Schmidi R.F. and Thews G Human physiology Springer verlong
8. Parvathi Pal A text book of practical physiology

# SEMESTER-II

**Papers**

1. Elementary aspects of Biochemistry
2. Elementary Microbiology
3. Basics of General ,Systemic, Clinical, hematology and histopathological technique
4. English for Communication
5. Environmental Science
6. Discipline Specific Electives (DSE)
    a. Basic aspects of research
    b. Sample collection, preservation and transportation
    c. Sterilization
    d. disinfection
    e. Antibiotic resistance
    f. Phlebotomy
    g. Museum Technology

# Second semester distribution of hours and credit- CBCS scheme

| Subject | Paper | Subjects | Theory | | Demonstrations/ assignments | | Tutorials | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | hours | **Credits** | hours | **Credits** | hours | **Credits** | Hours | **Credits** |
| Core course (CC) | Paper-I B101 | Elementary aspects of biochemistry | 40 | **02** | 40 | **01** | 40 | **02** | 160 | **05** |
| | Paper-I B102 | Elementary microbiology. | 40 | **02** | 40 | **01** | 40 | **02** | 160 | **05** |
| | Paper-1 B103 | Basics of general ,systemic, clinical, hematology and histopathological technique | 40 | **02** | 40 | **01** | 40 | **02** | 160 | **05** |
| Compulsory foundation Course (FC) | | English for communication | 30 | **02** | | | - | - | 30 | **02** |
| Ability enhancement course (AEC) | | Environmental science | 30 | **02** | Field visit- | **01** | - | - | 30 | **03** |
| | | Total | 180 | **09** | 240 | **07** | 120 | **03** | 540 | **20** |
| Discipline specific electives (DE) | | Biochemistry* | | 1 Basic aspects of research (01) credit<br>2 Sample collection, preservation and transportation (01 credit) | | | | | | **01** |
| | | Microbiology* | | 1. Sterilization and disinfection (01 credit)<br>2. Antibiotic resistance (01 credit)<br>3. Specimen collection and transportation (01 credit) | | | | | | |
| | | Pathology* | | 1.Phlebotomy (01 credit)<br>2. Museum Technology (01credit) | | | | | | |
| | | | | **Grand Total** | | | | | | **21** |

Note: choose any one elective from DSE during second semester in the subject *

# Second semester distribution of marks- CBCS scheme

| Subject | Paper/code | Subjects | Theory | | | | Practical | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory | Viva voce | I.A | Sub total | Practical | I.A | Sub total | Grand total |
| CC Bio chemistry | Paper-I B101 | Elementary aspects of biochemistry | 80 | - | 20 | 100 | - | - | - | 100 |
| CC Micro biology | Paper-I B102 | Elementary microbiology. | 80 | - | 20 | 100 | - | - | - | 100 |
| CC Pathology | Paper –I B103 | Basics of general ,systemic, clinical, hematology and histopathological technique | 80 | - | 20 | 100 | - | - | - | 100 |
| Compulsory foundation course (CF) | | English for communication | 50 | - | - | 50 | | - | - | 50 |
| Ability enhancement course (AEC) | | Environmental science- | 60- | -- | 20 | 80 | -- | - | - | 80 |
| Discipline specific electives (DE) | Biochemistry | 1. Basic aspects of research | 30 | - | - | 30 | - | - | - | 30 |
| | | 2.Sample collection, preservation and transportation | | | | | | | | |
| | | 1.Sterilization and disinfection | | | | | | | | |
| | | 2.Antibiotic resistance | | | | | | | | |
| | | 3.Specimen collection and transportation | | | | | | | | |
| | Pathology | Phlebotomy (01 credit) | | | | | | | | |
| | | 3.Museum Technology (01credit) | | | | | | | | |
| | | **Total** | **380** | | **80** | **460** | **-** | **-** | **-** | **460** |

**Note: No practical examinations in semester –II Biochemistry, pathology and microbiology**

# DETAILS OF THE COURSES

## I. CORE COURSES- BIOCHEMISTRY

1. Elementary aspects of Biochemistry.

### Discipline specific elective biochemistry

1. Basics aspects of Research
2. Sample collection, preservation and transportation

## II CORE COURSES – MICROBIOLOGY

1. Elementary Microbiology.

### Discipline specific elective Microbiology

1. Sterilization and Disinfection
2. Antibiotic resistance
3. Specimen collection and transportation

### Ability enhancement course

1. Environmental Science

### Compulsory foundation course

1. English Communication

## III CORE COURSES – PATHOLOGY

1. Basics of general, systemic, clinical, hematology and histopathological technique

### Discipline specific elective Pathology

1. Phlebotomy (01 credit)

2. Museum Technology (01credit)

## SECOND SEMESTER PROGRAMME STRUCTURE

| Semester | Course Opted | Course Name | Credits |
|---|---|---|---|
| second semester | **Core courses- Biochemistry** | **1. Elementary aspects of Biochemistry** | 05 |
| | **Discipline specific elective – Biochemistry** | 1. Basics aspects of research | 01 |
| | | 2. Sample collection, preservation and transportation | |
| | **Core courses – Microbiology** | **1. Elementary Microbiology.** | 05 |
| | **Discipline specific elective Microbiology** | 1. Sterilization and Disinfection | 01 |
| | | 2. Antibiotic resistance | |
| | | 3. Specimen collection and transportation | |
| | **Ability enhancement course** | 1. Environmental science | 03 |
| | **Compulsory foundation course** | 1. English communication | 02 |
| | **Core courses pathology** | **1. Basics of general, Systemic, Clinical, hematology and histopathological technique** | 05 |
| | **Discipline specific elective Pathology** | 1. Phlebotomy (01 credit)<br>2. Museum Technology (01credit) | 01 |

Note: choose any one elective from DSE during second semester in the subject *

**SEMESTER-II**
**B.Sc. Allied Health Science Programmes Syllabus**
**Subject: Biochemistry**
**Paper-I**
**Paper Title: (Elementary aspects of Biochemistry)**

**Credits (Theory 02, Demonstartion 01)**

**Theory lectures: 40**

**Unit –I**
**04hour**
**Laboratory hazards and its prevention**
Common laboratory accidents and ways for its prevention. First Aid in the Clinical laboratory, Laboratory precautions, storage and handling of dangerous chemicals, safety measures. Conventional and SI Units

**Unit-2** **02 hours**
Definition of Atomic weight, Molecular weight and Equivalent weight of elements and compounds

**Unit-3** **05 hours**
Normality, Molarity, Molality – definition and preparation of solutions with examples

**Unit 4**
**Acids and Bases** **06hour**
Definition. Properties, theories, Classification, examples of strong and weak acids.
Basic concepts of Acid base reaction, Ionization of water, pH- definition, Henderson's Hassel Bach's equation, its applications and measurement.

**Unit-5** **02hour**
**Indicators**
Definition, concepts, mechanisms of an indicator, use and its limitations, Commonly used indicators and their pH range. Ideal pH indicators used in different titrations. Universal indicators

Unit-6: **04hour**
**Buffers**
Definition, mechanism of action, various types of buffers with example and applications, Preparation of Buffer solutions using pH meter

**Unit-7** **02hour**

Normal values and its interpretations

**Unit 8** **06hour**

**Biophysics**

Various grades of chemicals, reagents and water. Biomedical waste management Waste disposal in the laboratory. Medico legal aspects of laboratory technicians and laboratory ethics

**Unit-9** **05hour**

Specimen collection preservation and transportation-blood urine and other body fluids.

**Unit 10** **04hours**

**Quality control**

Definition, types, IQAS and EQAS. Calculation of mean, standard deviation and percentage of coefficient of variation.

**SEMESTER-II**
**B.Sc. Allied Health Science Programmes**
**Syllabus**
**Subject: Biochemistry**
**Paper-I**
**Paper Title: (1.Elementary aspects of biochemistry)**

**Demonstrations** **(01 credit)**

**Unit-1** **08 hours**

Introduction to laboratory apparatus
Pipettes, Types Calibration
Burettes, beakers, petri dishes, depression plates, funnels
Flask, Bottles, Measuring cylinders, test tubes, centrifuge tubes, dispensers, tripod stand, wire gauze, Bunsen burner, desiccator, stop watch (Types - reagent bottles, wash bottles , specimen bottles)

Cuvettes (Types, precautions, uses and limitations)

Maintenance of glassware and apparatus, Significance of borosilicate glass, Care and cleaning of glass ware and plastic ware, Different cleaning solution

**Unit-2** **12 hours**

Introduction to instruments
Water bath, Oven, Incubators, Water distillation plant and water deionizers (Use, care and maintenance)
Refrigerators, Cold box, Deep freezers Reflex condenser (Use, care and maintenance)
Centrifuges (Types, Principle, procedure, RPM, Use, care and maintenance, limitations)
Laboratory balances (Types, Use, care and maintenance, procedure for weighing different chemicals)

pH meter (Principle, procedure, types of electrodes use, care, maintenance)

**Unit-3** **4 hour**

Dilutions, Reagent dilution techniques, calculating the dilution of a solution (Preparation of 0.1 N NaCl, 1 N Hcl etc.)

**Unit –4** **4 hour**

Stock solution, working standard, saturated and super saturated solutions
Preparation of glucose, urea etc. Volumetric flask- uses, limitations in preparing standard solutions

**Unit-5** **4 hour**

Preparations of normal solutions Preparation of molar solutions, % solutions, v/v, w/v solutions Conversion of % solution into molar solutions
(Preparation of 1 N Na2 Co3, 1 NaOH, 0.1 N HCl etc)

**Unit-6** **02 hours**

Titration of simple acid using a base
Demo- Titration of oxalic acid using NaOH

**Unit-7** **02 hours**

Normal values & interpretations –
(Normal reference range)

**Reference Books Biochemistry**


1. Varley – Clinical chemistry
2. TEITZ – Clinical chemistry
3. Kaplan – Clinical chemistry
4. Ramakrishna(S) Prasanna(KG), Rajna ® Text book of Medical Biochemistry Latest Ed Orient longman Bombay
5. Vasudevan (DM) Sreekumari(S) Text book of Biochemistry for Medical students , LatestEdn
6. DAS (Debajyothi) Biochemistry Latest ED Academic, Publishers, Culcutta
7. Rajagopal G & Ramakrishna –Practical Biochemistry for Medical Students oriental Blackswan Pvt. Ltd.
8. Shivarjshankara Y.M Practical Biochemistry
9. Murray R.K harpers Biochemistry Mc graw Hill
10. Pankaj Naik Biochemistry Jaypee publication..

**SEMESTER-II**

**B.Sc. Allied Health Science Programmes Syllabus**

**Subject: Microbiology**

**Paper Title: (Elementary Microbiology)**

**Credits (Theory 02, Demonstration 01)**

**Theory lectures: 40**

**Unit-1** **05 hour**

**Bacterial cell***: Anatomy, labeled diagram,

**Antibiotics* :** Commonly used antibiotics, target sites , misuse of antibiotics
Penicillin, Ceftriaxone, ceftazidime, ciprofloxacin, streptomycin, Erythromycin

**Unit-2** **06 hour**

**Sterilization & Disinfectants* :**

- Define sterilization and disinfection
- Enumerate the different physical methods of sterilization
- Diagram of Autoclave , principle , articles to be sterilized
- Diagram of Hot Air oven, principle , articles to be sterilized
- Enumerate the commonly used chemical disinfectants & their uses.
  Phenol, Aldehydes, halogens, Ethylene oxide, detergents, antiseptics
- Describe disinfection of operation theatre

**Unit-3** **03 hour**

**Infection** :
Types: acute, chronic , Primary, reinfection, secondary, cross, nosocomial, iatrogenic, subclinical, latent, atypical Source and modes of transmission with examples.

Types of infectious diseases : outbreak, endemic, epidemic , pandemic,

**Unit-4** **02 hour**

**Immunity :**
Antigen & its properties
Humoral immunity: classes of immunoglobulins and its biological role
Primary Immune response :
Secondary Immune response / Booster response
Vaccines:
Killed : DPT, IPV
Live : BCG, OPV, MMR
Cell mediated immunity : cells involved , biological role

**Unit-5** **04 hour**

**Hypersensitivity***

Describe the clinical picture of anaphylaxis and mechanisms of anaphylaxis with clinical importance. Contact dermatitis: mechanism with examples

**Unit-6** **02 hours**

**Bacterial infections / diseases:** *

Draw a map of human body and mark the different lesions/ diseases caused by the following bacteria :

- Mycobacterium tuberculosis
- Vibrio cholera
- Salmonella typhi
- Leptospira
- Treponema pallidium
- Coynebacterium diphtheria
- Staphylococcus ,
- Streptococcus,
- Pneumococcus
- E. coli
- Klebsiella ,
- Pseudomonas

Describe the modes of transmission, cardinal clinical manifestations & samples to be collected in the above infections

**Unit-7** **08 hours**

**Viral infections / diseases:***

Draw a map of human body and mark the different lesions/ diseases caused by the following Viruses :

- Hepatitis A, B ,C viruses ,
- Rabies ,
- HIV
- Arboviruses – Dengue , chikungunya ,
- Measles , Mumps ,
- Influenza ,
- Herpes, Chicken pox

Describe the modes of transmission , cardinal clinical manifestations & samples to be collected in the above infections

**Unit-8** **02 hour**

**Fungal infections / diseases :***

Draw a map of human body and mark the lesions / diseases caused by opportunistic fungus

- Candida,
- Cryptococcus,
- Aspergillus,
- Penicillium,
- Mucor ,
- Rhizopus

Describe the modes of transmission , cardinal clinical manifestations & samples to be collected in the above infections

**Unit-9** **04 hours**

**Parasitic infections / diseases :***

Draw a map of human body and mark the lesions / diseases caused by the following parasites :

- Entamoeba
- Plasmodium
- Leishmania
- Trichomonas,
- Giardia ,
- Heliminths : Hook worm , Round worm , Pork Tape worm , Beef Tape worm, Dog Tape worm , Pin worm , Filarial worms

Describe the modes of transmission , cardinal clinical manifestations & samples to be collected in the above infections

Describe the preventive & control measures against the heliminths

**Unit-10** **04 hours**

**Bio safety**

Describe the standard precautions to be followed in the work place

Describe the hand hygiene technique
Describe the segregation and appropriate color coded containers for biomedical waste
Describe the post exposure prophylaxis against HIV, Hepatitis B and Rabies
Describe blood spill management

**Note: * these chapters can be asked for long essay**

**Electives:**

- Sterilization and Disinfectants
- Antibiotic Resistance
- Specimen collection and transportation

**Reference Books Microbiology**


1. Ananthanarayana & Panikar Text book of Medical Microbiology Universities press
2. Text book of Microbiologgy by C.P.Baveja
3. Chatterjee- Parasitology – Interpretation to clinical medicine.
4. Basic laboratory methods in Parasitology, 1st Ed, J.P.boros, New Delhi-199.
5. Basic laboratory procedures in clinical bacteriology 1st Ed, JP.Brothers, New Delhi.
6. Practical microbiology methods for LAB Technicians.
7. Bhatia R : Essentials of medical Microbiology Jay pee New delhi
8. Vandepitte J Basic laboratory procedures in clinical bacteriology Jay pee publications
9. Colle JG Practical Medical Microbiology USA
10. Chatterjee K D parasitology Chatterjee medical publishers

**SEMESTER-II**

**B.Sc. Allied Health Science Programmes Syllabus**

**Subject: Pathology**

**Paper-I Paper Title: (**Basics of Hematology, clinical pathology and histopathological techniques**)**

**Credits (Theory 02, Demonstration 01)** **Theory lectures 40**

**Unit-1**
**(Basics in General Pathology)**

**Cell injury**: agents causing cell injury, cellular adaptations (hypertrophy, atrophy, hyperplasia, metaplasia) reversible and irreversible injury.

**Inflammation:** cardinal signs of inflammation, acute and chronic inflammation. Laboratory tests in inflammation.
**Hemodynamics:** edema, thromboembolism, shock
**Neoplasia**: definition of neoplasm, differences between benign and malignant tumors, carcinogenesis
**Infections:** tuberculosis, leprosy Environmental pollution

**Unit-2**
**(Basics in systemic pathology)**
Cardio vascular system (CVS): Atherosclerosis and its complication, hypertensive heart disease, Myocardial infarction.
Leucocytes: causes for leukocytosis and leucopenia, leukemia
Respiratory system; Pneumonia, Lung cancer
GIT: peptic ulcer, gastric cancer
Liver: viral hepatitis, Gall stones
Kidney: UTI Urinary stones
Breast: Fibroadenoma, breast carcinoma
CNS: meningitis

**Unit –3**
**( Basics of hematology and blood banking)**
Blood collection, hemoglobin, ESR,PT/aPTT
RBC's: Definition of anemia,iron deficiency anaemia and megaloblastic anaemia
Blood grouping and Rh typing

**Unit-4**
**(Clinical Pathology)**
Urine examinations
Collection and transport of various clinical specimens
**Unit-5 ( Techniques in pathology)**

Basics in tissue processing, FNAC, staining techniques.

**DEMONSTRATIONS**

Hemoglobin estimation.

Erythrocytes sedimentation Rate (ESR)

Urine examination

H&E staining

Blood grouping

Rh typing

**Reference Books Pathology**


1. Culling Histopathology techniques
2. Bancroft Histopathology techniques
3. Koss – cytology
4. Winifred Greg – Diagnostic cytopathology
5. Orell – Cyto Pathology
6. Todd & Sanford Clinical Diagnosis by laboratory method
7. Dacie & Lewis – Practical Haematology
8. Ramanic Sood, Laboratory Technology (Methods and interpretation) 4th Ed.J.P. Bros, New Delhi
9. Satish Gupta Short text book of Medical Laboratory for technician J.P. Bros, New Delhi
10. Sachdev K.N. Clinical Pathology and Bacteriology 8th Ed, J.P. Bros, New Delhi-
11. Krishna - Text book of Pathology, Orient Longman PVT Ltd.

# SEMESTER-III

**Papers**

1. Applied Pathology & Microbiology
2. Introduction to Cardiac Perfusion Technology
3. Applied Pharmacology
4. Medicine Relevant to Cardiac Perfusion Technology
5. Skill Enhancement Course

   SAFE -I

**SEMESTER-III**
**B.Sc. in Cardiac Perfusion Technology programme Syllabus**
**Paper 1 Subject: Applied Pathology & Microbiology**

**Credits (Theory 02, Practical 01, Demonstration 01)**

## APPLIED PATHOLOGY

I. CARDIOVASCULAR SYSTEM

- Atherosclerosis- Definition, risk factors, briefly Pathogenesis & morphology, clinical significance and prevention.
- Hypertension- Definition, types and briefly Pathogenesis and effects of Hypertension.
- Aneurysms – Definition, classification, Pathology and complications.
- Pathophysiology of Heart failure.
- Cardiac hypertrophy – causes, Pathophysiology & Progression to Heart Failure.
- Ischaemic heart diseases- Definition, Types. Briefly Pathophysiology, Pathology & Complications of various types of IHD.
- Valvular Heart diseases- causes, Pathology & complication. Complications of artificial valves.
- Cardiomyopathy – Definition, Types, causes and significance.
- Pericardial effusion- causes, effects and diagnosis.
- Congenital heart diseases – Basic defect and effects of important types of congenital heart diseases.

II. HAEMATOLOGY

- Anaemia – Definition, morphological types and diagnosis of anaemia. Brief concept about Haemolytic anaemia and polycythaemia.
- Leukocyte disorders- Briefly leukaemia, leukocytosis, agranulocytosis etc.,
- Bleeding disorders- Definition, classification, causes & effects of important types of bleeding disorders. Briefly various laboratory tests used to diagnose bleeding disorders.

## APPLIED MICROBIOLOGY

**1.** Health care associated infections and Antimicrobial resistance: Infections that patients acquire during the course of receiving treatment for other conditions within a healthcare setting like Methicillin Resistant Staphylococcus aureus infections, Infections caused by Clostriduium difficle, Vancomycin resistant enterococci etc. Catheter related blood stream infections, Ventilator associated pneumonia, Catheter Related urinary tract infections, Surveillance of emerging resistance and changing flora. The impact and cost attributed to Hospital Associated infection.

**2.** Disease communicable to Healthcare workers in hospital set up and its preventive measure: Occupationally acquired infections in healthcare professionals by respiratory route ( tuberculosis, varicella-zoster, respiratory synctial virus etc ), blood borne transmission ( HIV, Hepatitis B, Hepatitis C, Cytomegalovirus, Ebola virus etc), oro faecal route ( Salmonella, Hepatitis A etc), direct contact ( Herpes Simplex Virus etc). Preventive measures to combat the spread of these infections by monitoring and control.

**3.** Microbiological surveillance and sampling: Required to determine the frequency of potential bacterial pathogens including Streptococcus pneumoniae, Haemophilus influenzae, and Moraxella catarrhalis and also to assess the antimicrobial resistance. Sampling: rinse technique, direct surface agar plating technique.

**SEMESTER-III**
**B.Sc. in Cardiac Perfusion Technology programme Syllabus**
**Paper II Subject: Introduction to Cardiac Perfusion Technology**
**Credits (Theory 02, Practical 01, Demonstration 01)**

**Paper II : Introduction to Cardiac Perfusion Technology**

## Basics of diagnostic techniques:

Chest of X-ray
ECG
Echo
Angiography
Nuclear Cardiology
Laboratory investigations in relation to perfusion technology
Cardiopulmonary bypass and perfusion technology
History of Cardiac surgery and perfusion
• Specific reference of Gibbon Lillehei, carrel
• Pre CPB surgery
• Azygous Flow principle.
• Hypothermic/nonhypothermic non-CPB surgery including gross's
Well technique and controlled cross circulation.

## Monitoring and instrumentation

• Concepts of monitoring – instrumentation technology of ECG machine, pressure transducer, syringe and peristaltic pumps, monitors, ventilators, pulse oximeters, temperature probes and thermo regulatory monitoring, defibrillators and fibrillators. Piped and non-piped gas delivery systems and connections. Basic physics related to medically used gases.
• Haemodynamic monitoring
• Haemostatic monitoring
• Haemotologic monitoring
• Maintenance of oxygen, carbon dioxide and acid-base status and their monitoring
• Neurological monitoring (SSPE, EEG and cerebral function monitor)
• Aseptic technique.
• Cardiac surgery team, profession and terminology, scope of perfusion technology

**SEMESTER-III**
**B.Sc. in Cardiac Perfusion Technology programme Syllabus**
**Paper III Subject: Applied Pharmacology**
**Credits (Theory 02, Practical 01, Demonstration 01)**

APPLIED PHARMACOLOGY

- General concepts about pharmacodynamic and Pharmacokinetic Principles involved in drug activity.

I. Autonomic nerves system.

- Anatomy & functional organisation.
- List of drugs acting an ANS including dose, route of administration, indications, contra indications and adverse effects.

II. Cardiovascular drugs- Enumerate the mode of action, side effects And therapeutic uses of the following drugs.

a. Antihypertensives

- Beta Adrenergic antagonists
- Alpha Adrenergic antagonists
- Peripheral Vasodilators
- Calcium channel blockers

b. Antiarrhythmic drugs
c. Cardiac glycosides
d. Sympathetic and nonsympathetic inotropic agents.
e. Coronary vasodilators.
f. Antianginal and anti failure agents
g. Lipid lowering & anti atherosclerotic drugs.
h. Drugs used in Haemostais – anticoagulants Thrombolytics and antithrombolytics.
i. Cardioplegic drugs- History, Principles and types of cardioplagia.
j. Primary solutions – History, principles & types.
k. Drugs used in the treatment of shock.

III. Anaesthetic agents.

- Definition of general and local anaesthetics.
- Classification of general anaesthetics.
- Pharmacokinetics and Pharmacodynamics of inhaled anaesthetic agents.
- Intravenous general anaesthetic agents.
- Local anaesthetics – classification mechanism of action, duration of action and methods to prolong the duration of action. Preparation, dose and routes of administration.

IV Analgessics

- Definition and classification
- Routes of administration, dose, frequency of administration, Side effects and anagement of non opioid and opiod analgesics

V. Antihistamines and antiemetics-

- Classification, Mechanism of action, adverse effects, Preparations, dose and routes and administration.

VI. CNS stimulants and depressants

- Alcohol
- Sedatives, hypnotics and narcotics
- CNS stimulants
- Neuromuscular blocking agents and muscle relaxants.

VII. Pharmacological protection of organs during CPB

**SEMESTER-III**
**B.Sc. in Cardiac Perfusion Technology programme Syllabus**
**Paper IV Subject: Medicine Relevant to Cardiac Perfusion Technology**
**Credits (Theory 02, Practical 01, Demonstration 01)**

### Cardiovascular System

- Ischaemic heart diseases
- Rheumatic heart disease
- Congenital heart disease
- Hypertension
- Aortic Aneurysms
- Cardiomyopathy
- Peripheral vascular disease
- Pulmonary edema and LV failure

### Hematology

- Anaemia
- Bleeding disorders
- Laboratory tests used to diagnose bleeding disorders (in brief)

### Respiratory System

- Chronic obstructive airway diseases (COPD)
- Concept of obstructive versus restrictive pulmonary disease
- PFT and its interpretation

# SEMESTER-IV

**Papers**

1. Applied Pathology & Microbiology
2. Introduction to Cardiac Perfusion Technology
3. Applied Pharmacology
4. Medicine Relevant to Cardiac Perfusion Technology

**SEMESTER-IV**
**B.Sc. in Cardiac Perfusion Technology programme Syllabus**
**Paper I Subject: Applied Pathology & Microbiology**
**Credits (Theory 02, Practical 01, Demonstration 01)**

## APPLIED PATHOLOGY

I. RESPIRATORY SYSTEM

- Chronic obstructive airway diseases – Definition and types. Briefly causes, Pathology and complications of each type of COPD.
- Briefly concept about obstructive versus restrictive pulmonary disease.
- Pneumoconiosis- Definition, types, Pathology and effects in brief.
- Pulmonary congestion and edema.
- Pleural effusion – causes, effects and diagnosis.

II. RENAL SYSTEM

- Clinical manifestations of renal diseases. Briefly causes, mechanism, effects and laboratory diagnosis of ARF & CRS. Briefly Glomerulonephritis and Pyelonephritis.
- End stage renal disease – Definition, causes, effects and role of

dialysis and renal transplantation in its management.

- Brief concept about obstructive uropathy.

PRACTICALS

1. Description & diagnosis of the following gross specimens.
a. Atherosclerosis.
b. Aortic aneurysm.
c. Myocardial infraction.
d. Emphysema
e. Chronic glomerulonephritis.
f. Chronic pyelonephritis.
2. Interpretation & diagnosis of the following charts.
a. hematology Chart - AML, CML, Hemophilia, neutrophilia, eosinophilia.
b. Urine Chart - ARF, CRF, Acute glomerulonephritis.
3. Estimation of Hemoglobin.
4. Estimation Bleeding & Clotting time.

## APPLIED MICROBIOLOGY

**1.** Importance of sterilization:
a. Disinfection of instruments used in patient care: Classification, different methods, advantages and disadvantages of the various methods.
b. Disinfection of the patient care unit
c. Infection control measures for ICU's 10 Hours
**2.** Sterilization:
a. Rooms: Gaseous sterilization, one atmosphere uniform glow discharge plasma (OAUGDP).
b. Equipments: classification of the instruments and appropriate methods of sterilization.
c. Central supply department: the four areas and the floor plan for instrument cleaning, high-level disinfecting and sterilizing areas. 8 Hours
6. Preparation of materials for autoclaving: Packing of different types of materials, loading, holding time and unloading. 4 Hours

## PRACTICALS- 30 HOURS

1. Principles of autoclaving & quality control of Sterilization.
2. Collection of specimen from outpatient units, inpatient units, minor operation theater and major operation theater for sterility testing.
3. The various methods employed for sterility testing.
4. Interpretation of results of sterility testing.
5. Disinfection of wards, OT and Laboratory.

Scheme of Examination
Theory
There shall be one theory paper of three hours duration carrying 50 marks.
Distribution of type of questions and marks for Applied Microbiology shall be as given under.

**SEMESTER-IV**
**B.Sc. in Cardiac Perfusion Technology programme Syllabus**
**Paper II Subject: Introduction to Cardiac Perfusion Technology**
**Credits (Theory 02, Practical 01, Demonstration 01)**

**Physiology of Extracorporeal circulation**
**Heart – Lung machine**
• Principles of extracorporeal circulation
• Materials used in EC circuit
• Principles of extracorporeal gas exchange

**Various types of oxygenators**
• Bubble oxygenators
• Rotating spiral/cylinder/disc oxygenators
• Membrane oxygenators
• Mechanism of action components defoaming, rated flow.

**Theory of blood pumps**
• Ideal blood pump, pulsatile versus non-pulsatile flow, occlusive and non-occlusive pumps, various types of pumps roller, bellow, sigmamotor, diaphragm, ventricular and centrifugal pumps.

**Element of extracorporeal circulation/hazards of:**
a. blood failure
b. Bubble trap
c. Flow meters
d. Temperatures
e. Heat exchanger
f. Regulating devices

**Connection of the vascular system with extracorporeal circulation:**
• Arterial and venous cannulae.
• Connecting tubes and connectors
• Vents
• Suckers
• Cardioplegia delivery system
• Venous drainage.
Haemodynamic of arterial return, venous drainage, cardioplegia Delivery and venting.
Blood banking, handling of blood products and their management. Blood components and their use.

**SEMESTER-IV**
**B.Sc. in Cardiac Perfusion Technology programme Syllabus**
**Paper III Subject: Applied Pharmacology**
**Credits (Theory 02, Practical 01, Demonstration 01)**

I. Inhalational gases and emergency drugs.
II. Pharmacotherapy of respiratory disorders
- Introduction – Modulators of bronchial smooth muscle tone and pulmonary vascular smooth muscle tone
- Pharmacotherapy of bronchial asthma
- Pharmacotherapy of cough
- Mucokinetic and mucolytic agents
- Use of bland aerosols in respiratory care.

III. Corticosteroids – Classification, mechanism of action, adverse effects and complications. Preparation, dose and routes of administration.
IV. Diuretics
- Renal physiology
- Side of action of diuretics
- Adverse effects
- Preparations, dose and routes of administrion.

V. Chemotherapy of infections
- Definition
- Classification and mechanism of action of antimicrobial agents
- Combination of antimicrobial agents
- Chemoperophylaxis.
- Classification, spectrum of activity, dose, routes of administration and adverse effects of penicillin, cephalosporins, aminoglycosides, tetracyclines, chloramphenicol, ntitubercular drugs.

VI. Miscellaneous.
- IV fluids- various preparations and their usage.
- Electrolyte supplements
- Immunosuppressive agents
- New drugs included in perfusion technology.
- Drugs used in metabolic and electrolyte imbalance.

**Demonstration:**
1. Preparation and prescription of drugs of relevance.
2. Experimental pharmacology directed to show the effects of commonly used drugs of relevance and interpretation of few charts.

Scheme of Examination
Theory
There shall be one theory paper of three hours duration carrying 80 marks.
Distribution of type of questions and marks for applied Pharmacology shall be as given under.

NO PRACTICAL EXAMINATION

**Recommended Books.**

1. R. S. Satoskar, S.D. Bhandarkar, S. S. Ainapure, Pharmacology and Pharmaco therapeutics, 18th Edition, single Volume, M/S Popular Prakashan, 350, Madan Mohan Marg, Tardeo, Bombay – 400 034.

2. 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.

3. Laurence and Bennet, Clinical Pharmacology, ELBS Edition, 9th Edition.

**SEMESTER-IV**
**B.Sc. in Cardiac Perfusion Technology programme Syllabus**
**Paper IV Subject: Medicine Relevant to Cardiac Perfusion Technology**
**Credits (Theory 02, Practical 01, Demonstration 01)**

**Renal System**
ARF & CRF
End stage renal disease
Role of dialysis and renal transplantation in its management

**CNS**
Automatic nervous system
(Sympathetic & Parasympathetic system)
Brief mention of CNS disorders & their etiology

**Others**
DM
Obesity
Pregnancy
Paediatric Patient (neonate/Infant)
Elderly patient

# SEMESTER-V

**Papers**

1. Cardiac Perfusion Technology-Clinical
2. Cardiac Perfusion Technology – Applied
3. Cardiac Perfusion Technology-Advanced

**SEMESTER-V**
**B.Sc. in Cardiac Perfusion Technology programme Syllabus**
**Paper I Subject: Cardiac Perfusion Technology- Clinical**
**Credits (Theory 02, Practical 01, Demonstration 01)**

## Paper-I Cardiac Perfusion Technology Clinical

1. Pharmacokinetics and Pharmacodynamics of Cardiopulmonary bypass

2. Drugs (including anesthetic drugs) used in cardiopulmonary bypass

3. Conduct and monitoring of Cardiopulmonary bypass

4. Adequacy of perfusion – General considerations, specific aspects of perfusion, monitoring, other concomitants which may affect its adequacy

5. Pulsatile perfusion – Introduction, theory & physiology of pulsatile flow, hemodynamic, metabolic effects, Clinical use, hematological effects

6. Cannulation techniques during cardaiopulmonary bypass

**SEMESTER-V**
**B.Sc. in Cardiac Perfusion Technology programme Syllabus**
**Paper II Subject: Cardiac Perfusion Technology- Applied**
**Credits (Theory 02, Practical 01, Demonstration 01)**

## Paper-II Cardiac Perfusion Technology – Applied

1. Blood cell trauma – analysis of forces of fluid motion, effects of physical forces o blood cell, clinical effect. Complications of blood transfusion.

2. Anticoagulation on bypass, its monitoring, its reversal and complications. Heparinless bypass. Platelet aggregation and platelet dysfunction. Coagulopathies due to cardiopulmonary bypass and its management.

3. Inflammatory response to cardiopulmonary bypass & its clinical effects. Methods to minimise the same. Immune response, neuroendocrine, renal, metabolic splanchnic response, pulmonary response and electrolyte response to cardiopulmonary bypass

4. Blood conservation hemofiltration & dialysis during cardiopulmonary bypass including modified ultra filtration reverse autologous priming and other methods

**SEMESTER-V**
**B.Sc. in Cardiac Perfusion Technology programme Syllabus**
**Paper III Subject: Cardiac Perfusion Technology- Advanced**
**Credits (Theory 02, Practical 01, Demonstration 01)**

## Paper-III Cardiac Perfusion Technology – Advanced

1. Perfusion techniques for Pediatric cardiac surgery

2. ECMO- special perfusion techniques for special cardiac surgeries and medical conditions including thoracic aortic surgeries deep hypothermia and circulatory arrest). Perfusion for non cardiac surgery, invasive cardiology and outside the operation suite.

3. Perfusion as a method of cardiopulmonary bypass

# SEMESTER-VI

**Papers**

1. Cardiac Perfusion Technology-Clinical
2. Cardiac Perfusion Technology – Applied
3. Cardiac Perfusion Technology-Advanced

**SEMESTER-VI**
**B.Sc. in Cardiac Perfusion Technology programme Syllabus**
**Paper I Subject: Cardiac Perfusion Technology- Clinical**
**Credits (Theory 02, Practical 01, Demonstration 01)**

## Paper-I Cardiac Perfusion Technology – Clinical

1. Termination of cardiopulmonary bypass – principles and methodology

2. Myocardial protection and cardioplegia- pretreatment of the Myocardium, cardioplegia, hypothermia, controlled reperfusion, myocardial protection for specific clinical problems, Complications of cardioplegia. Non cardioplegic methods during cardiac surgery on cardiopulmonary bypass

3. Oxygenation – general consideration, bubble & membrane (including assessment and comparison of oxygenator function)

4. Heat exchangers-principles function of heat exchangers & their assessment. Complications related to heat exchange and their management

5. Priming fluids and hemodilution

**SEMESTER-VI**
**B.Sc. in Cardiac Perfusion Technology programme Syllabus**
**Paper II Subject: Cardiac Perfusion Technology- Applied**
**Credits (Theory 02, Practical 01, Demonstration 01)**

## Paper-I Cardiac Perfusion Technology – Applied

1.Micro emboli- gaseous and particulate, filters used in cardiopulmonary bypass circuit.

2. Micro pore filtration during cardiopulmonary bypass

3. Counter pulsation techniques and assist devices

**SEMESTER-VI**
**B.Sc. in Cardiac Perfusion Technology programme Syllabus**
**Paper III Subject: Cardiac Perfusion Technology- Advanced**
**Credits (Theory 02, Practical 01, Demonstration 01)**

## Paper-III Cardiac Perfusion Technology – Advanced

1. Complications and safety during cardiopulmonary bypass – bypass safety, organizational aspects, accidents, coagulpathies, mechanical and electrical failures, perfusion management, perfusion systems, safety for the perfusionist and surgical team management of perfusion accidents.

2. Minimally invasive surgery and the perfusionist

3. Recent advances in perfusion techniques

4. Experimental perfusion

**Distribution of Type, Number and marks of Questions for Various Subjects**

**THEORY**

| Subjects having maximum marks = 100 | | | Total |
|---|---|---|---|
| Type of question | Number of questions | Marks for Each question | |
| Essay type | 02 ( no choice) | 10 | 20 |
| Short essay type | 12 (Answer any 10) | 5 | 50 |
| Short answer type | 12 (Answer any 10) | 3 | 30 |

| Subjects having maximum marks = 80 | | | Total |
|---|---|---|---|
| Type of question | Number of questions | Marks for Each question | |
| Essay type | 02 ( no choice) | 10 | 20 |
| Short essay type | 8 (Answer any 6) | 5 | 30 |
| Short answer type | 12 (Answer any 10) | 3 | 30 |

| Subjects having maximum marks = 50 | | | Total |
|---|---|---|---|
| Type of question | Number of questions | Marks for Each question | |
| Essay type | 02 ( no choice) | 10 | 20 |
| Short essay type | 5 (Answer any 3) | 5 | 15 |
| Short answer type | 7 (Answer any 5) | 3 | 15 |

| Subjects having maximum marks = 40 | | | Total |
|---|---|---|---|
| Type of question | Number of questions | Marks for Each question | |
| Essay type | 01 | 10 | 10 |
| Short essay type | 4 (Answer any 3) | 5 | 15 |
| Short answer type | 6 (Answer any 5) | 3 | 15 |

-End-