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.)]
TAMAKA, KOLAR-563103, KARNATAKA, INDIA
Ph: 08152-243009,+91 9448395232Fax: +918152 -243008 E-mail: registrar@sduu.ac.in/office@sduu.ac.in. Website: www.sduu.ac.in

(With effect from 2016-17 batches)

Choice Based Credit System Based Graduate Curriculum for Bachelor of Science in Blood Banking Technology

(2022-23)

Approved as per BOM-67-2022,(Resolution No-LXVII-07/22) Dated-02/07/2022

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.
Ph:+91- 08152-210604, 210605, 243003, 243009, Fax:08152-243008,
Website: www.sduu.ac.in

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.
Ph:+91- 08152-210604, 210605, 243003, 243009, Fax:08152-243008,
Website: www.sduu.ac.in

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. Semester: 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), Compulsory foundation course (FC) Discipline specific elective (DSE)
II	Basic medical sciences Common to all disciplines as mandatory core courses (CC), Compulsory foundation course (FC) Discipline specific elective (DSE) Ability enhancement course (AEC)
III	Core courses discipline wise (CCD) Skill enhancement course (SEC)
IV	Core courses discipline wise Ability enhancement course (AEC)
V	Core courses discipline wise (CCD) Skill enhancement course(SEC)
VI	Core courses discipline wise (CCD) 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 Paper 2 Paper 3 Paper 4	DSE-1 DSE-2 DSE-3 DSE-4	-	-	-	Basic Computer Application
II	Paper-1 Paper 2 Paper 3	DSE-1 DSE-2 DSE-3 DSE-4 DSE-5 DSE-6	Environmental science	-	-	English communication
III	Paper-1 Paper 2 Paper 3	-	-	SEC-1 (SAFE-I)	-	-
IV	Paper 1 Paper 2 Paper 3	-	Constitution of India	-	-	-
V	Paper 1 Paper 2 Paper 3	-	-	SEC-2 Medical Ethics		-
VI	Paper 1 Paper 2 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
- Bachelor of Science in Cardiac Care Technology
- Bachelor of Science in Cardiac Perfusion Technology
- Bachelor of Science in Respiratory Care Technology
- Bachelor of Science in Emergency Medicine Technology
- Bachelor of Science in Blood Banking Technology
- Bachelor of Science in Clinical Psychology

2. DURATION

The duration of the under graduate Programs shall be four years consists of 3 years Study period (6 semesters) and one year internship.

Ref Notification No. SDUAHER/KLR/ADMN/1071/2021-22, dt. 04.09.2021

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 ATTENDANCE

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.

15. a) **POLICY FOR REVALUATION OF ANSWER SCRIPTS**

Notified in a vide letter No. SDUAHER/KLR/ADMN/468/2021-22, dt. 04.07.2022 to implement the policy for revaluation of answer scripts, and the same has been added in to examination manual. Policy consists of guidelines for photo / Xerox copy of the evaluated answer scripts and guide line for photo/ Xerox copies of the evaluated answer scripts and revaluation.

The candidate who has failed subject/s in theory (without considering the IA /viva / Practical) examination only can apply for revaluation within 10 days from published results through Principal of the college by remitting Rs. 5000/- per theory paper in noncash mode.

Note: For more information refer examination manual in website: www.sduaher.ac.in

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		

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

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

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. Pr.	050 020	041 012	025 005	020 003	075 025	061 015	004	7.6	30.4	Pass
02	**Anatomy-II :** Systemic Histology and Gross Anatomy	Th. Pr.	050 020	027 013	025 005	020 003	075 025	047 016	004	6.3	25.2	Pass
03	**Physiology-I :** Physiological functions of the body	Th. Pr.	050 020	041 018	025 005	021 005	075 025	062 023	004	8.5	34.0	Pass
04	**Physiology-II :** Physiology of Hormonal and Regulatory function	Th. Pr.	050 020	038 017	025 005	021 004	075 025	059 021	004	8.0	32.0	Pass
	Foundation Course											
05	Basic Computer Applications	Th. Pr.	050 020	023 020	- -	- -	050 020	023 020	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	

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH

KOLAR KARNATAKA

Adoption of Choice based credit system for

B.Sc. Blood Banking Technology

(Program Code BBT)

UNDER FACULTY OF ALLIED HEALTH SCIENCES

As per University Grants Commission

2022 – 23

At a glance this logo is abstract, yet it contains the vital ingredients for an institution like Sri Devaraj Urs Academy of Higher Education and Research.

The institution's medical background, humanitarian values, Compassion, approachability, social commitment and the subsequent research towards the most precious thing, the human life, is the core theme.

The graphic form of a person in the centre of a bud represents the humanity. It denotes the growing process of life and its existence. And the two hands safeguarding them show the care and a sense of security. It is also capable of holding something within the vast expanse of knowledge by the university for the people's benefit. Hence, the motto " Knowledge for Posterity" is very appropriate and gives a punch in Red. The four light blue half circles (smaller to bigger) depict the unending quest for knowledge and imparting it to a wider horizon, growing higher and higher.

And finally, the whole unit is embedded in a "D" shaped graphic template as background to give it a corporate identity.

COLORS USED:

Deep Blue:Credible, Confident and dependable. Represents Peace, tranquility, stability, harmony, trust, security, cleanliness and loyalty.

Light Blue: For sky and water (colour scheme for 4 half circles)

Red: A dominant colour for strengths.

Green:For nature, health and generosity. It's cool quality soothes and has great healing powers.

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH

VISION

"**UNIVERSITY OF EXCELLENCE - KNOWLEDGE FOR POSTERIT**Y"

MISSION

- To be a global center of excellence for Teaching, Training and Research in the field of Higher Education.
- To inculcate scientific temper, research attitude and social accountability amongst faculty and students.
- To promote with value based education for the overall personality development and leadership qualities to serve the humanity.

OBJECTIVES

- To provide need based infrastructure and facilities to students to become responsible professionals with social commitment and accountability.
- To implement effectively innovative programs in teaching learning and evaluation.
- To impart scientific and socio cultural temperament among students to forge National identity and needs.
- To provide instruction and training in basic and advanced branches of learning.
- To provide facilities for research for the advancement and dissemination of knowledge.
- To undertake extra mural studies, consultancy, extension programs and field outreach services for the development of society.
- To collaborate with other Universities, Institutions of excellence and Research Organizations within the country and outside for the purpose of teaching, training and research.
- To undertake need based activities for the betterment of socially and educationally backward society.

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION & RESEARCH
Comprising Sri Devaraj Urs Medical College
(A-Deemed-To-Be-University)

Declared under Section 3 of UGC Act, 1956, MHRD GOI No.F.9-36/2006-U.3(A) Dt. 25th May 2007
POST BOX NO.62, TAMAKA, KOLAR-563 101, KARNATAKA, INDIA
Ph:08152-243244, 210604, 210605. Fax:08152-243008. E-mail: registrar@sduu.ac.in/office@sduu.ac.in. website: www.sduu.ac.in

No: SDUAHER/KLR/ADMN/ 2063 / 2016-17 **Date: 20.10.2016**

NOTIFICATION

Sub: Implementation of **Choice Based Credit System** for the Undergraduate degree programs under the Faculty of Allied Health science.

Ref: 1.UGC Guideline D.O.No F.1-1/2014 dated 12th Nov.2014
2. Proceedings of the 16th meeting of Board of studies of Health science subjects held on 25.08.2016
3.Proceedings of the committee of the Academic Council meeting held on 13.10.2016
4. Proceedings of the 41st meeting of Board of Management held on 19.10.2016

Sri Devaraj Urs Academy of Higher Education and Research after establishing a department of Allied health sciences has been offering B.Sc. courses in the Blood Banking Technology, Imaging Technology, Operation Theater technology, Renal Dialysis Technology, Ophthalmic technology and Radiotherapy Technology. All these courses are under semester system but have not followed CBCS as recognized by University Grants Commission. However, in the light of the UGC letter referred above, the University has taken necessary steps to implement CBCS from the Academic Year 2016-17. Accordingly, the subject was placed in the meetings of the authorities of the University as cited above and the University is pleased to announce that the undergraduate courses offered in the Department of allied health Sciences shall follow Choice Based credit system with effect from the Academic year 2016-17 onwards.

By Order,

Sd/-
Registrar

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.)]
TAMAKA, KOLAR-563 103, KARNATAKA, INDIA
Ph: 918152-243003, +91 9448395282, Fax : +918152 - 243008 E-mail – office@sduaher.ac.in

No. SDUAHER/KLR/ADMN/734/2022-23

Date: 14-07-2022

NOTIFICATION

Sub: Start of B.Sc. Blood Banking Technology Program – reg.

Ref: Proceedings of the 67th Board of Management held on 02.07.2022
Proceedings of the 40th Academic Council held on 01.06.2022

In accordance with the decision taken in the 67th Board of Management meeting held on 02.07.2022, The Academy has decided to start B.Sc. in Blood Banking Technology Program under Faculty of Allied Health and Basic sciences from the Academic year 2022-23. Accordingly, The Academy hereby announces and notifies the above decision and shall come into effect from the Academic year 2022-23.

Registrar
SDUAHER
Registrar
Sri Devaraj Urs Academy of Higher
Education and Research
Tamaka, Kolar - 563 103.

PROGRAM EDUCATIONAL OBJECTIVES (PEO) :

PEO-1: A technologist expert involved in patient care and perform multi-task activities with responsibility.

PEO-2: As communicators possessing requisite communication skills to convey the information in a right manner in different health care settings.

PEO-3: Demonstrate basic leadership skills.

PEO-4: As Lifelong learner to keep on updating oneself with technology advancement in the health care field and able to perform the role of a good technologist and /or, researcher and teacher.

PEO-5: Technologist who follows the principle of bio-ethics in health care service.

PROGRAM OUTCOMES

PO1: Performs the duty as a blood bank Technologist, having skills in a good written & communication, computer applications.

PO2: To gain knowledge about laboratory safety precautions, biomedical waste management and preventing the spread of infectious diseases.

PO3: Understanding the structure and functions of different organs in normal human body.

PO4: To learn the Biochemistry, Microbiology and Pathology, gaining expertise in Clinical Laboratory Practices.

PO5: Know how to follow sample acceptance and rejection criteria and also to pack, transport and store the samples.

PO6: Understanding of blood bank department and organization in a hospital

PO7: To gain knowledge about collection and processing, including selecting donors, collecting blood, blood group typing and molecular testing and drug reactions.

PO8: To learns the test for blood group antigens, compatibility and antibody identification, Check blood for any viral / bacterial infections. Be cautious of transfusion-transmission infections.

PO9: Understand the basic concepts of hematology and blood components in detail

PO10: Understand the immune hematological tests

PO11: To learn the transfusion therapy and newly advanced blood bank equipment's require for process

PO12: Understand Quality control, Quality policy, quality manual, internal and external audit and process control

PO13: Understand stem cell preparation, recent advances in blood banking and apheresis.

PO14: To know about work place based hazards and basic law and ethics in blood banking

Structure of B.Sc. Blood Banking Technology Program 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	1&2.Anatomy –I & II 3&4.Physiology – I & II	DSE-1 DSE-2 DSE-3 DSE-4	Spoken Kannada	-	-	Basic Computer Application
II	5. General Biochemistry 6. General Microbiology 7. General Pathology	DSE-1 DSE-2 DSE-3 DSE-4 DSE-5 DSE-6	Environmental studies Spoken Kannada	-	-	English for Communication
III	8 Applied aspects of Biochemistry 9. Applied aspects of Microbiology 10. Applied aspects of Pathology			SEC-1 (Flow-cytometer)	-	-
IV	11.Introduction to blood banking and Blood banking organization 12.Blood donation and donor management 13.Basic Immuno hematology and transfusion transmitted disease		Constitution of India	-	-	-
V	14. Blood components, preparation and component therapy 15. Transfusion therapy and blood bank equipment 16.Quality control and documentation			SEC-2 Medical Ethics	-	-
VI	17.Advanced Immuno hematology and Immunology 18.Apheresis and Autologous transfusion 19.Advances in transfusion medicine	-	Bio safety and bio medical management	-	-	-
VII& VIII	Internship					

SEMESTER-I

Papers

1. General Anatomy, Histology & Embryology
2. Systemic Histology & Gross anatomy
3. Physiological functions of the body
4. Physiology of hormonal and regulatory function
5. Basic Computer Application
6. Discipline specific electives (DSE)
    a. Histology Techniques preparation of slides & stains
    b. Museum Preparation
    c. Electro Cardiogram(ECG)
    d. Pulmonary Function Test (PFT)

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	A107	Basic computer application	30	**02**	30	**01**	-	**-**	60	**03**
		Total	170	**11**	150	**05**	120	**04**	440	**19**
	A108 A109	Discipline specific electives (DSE)	Anatomy*	1 Histology Techniques preparation of slides & stains (01 credit)						**01**
				2 Museum preparation (01 credit)						
	A110		Physiology *	1 ECG (01 credit)						
	A111			2 Pulmonary function test (01 credit)						
Compulsory foundation course	A 112	Spoken Kannada								**02**
				Grand Total						**22**

Note: Each student has to choose any one discipline specific elective (DSE) offered during first semester in the core subject.
In accordance with the decision taken in the meeting of the 36th Academic council held on 30th Sept. 2020 and as per the notification No.SDUAHER/KLR/ADMN/2687/2020-21 dated 22nd March 2021 The Academy has decided to introduce spoken Kannada classes for 1st& 2nd semesters of Under graduate curriculum as subsidiary / departmental level subject

First semester distribution of marks- CBCS scheme

Subject	Paper &code	Subject	Theory	Theory IA	Viva voce	Practical	Practical I.A	Grand total	
Core subjects									
CC-Anatomy	Paper-I A101	General Anatomy, Histology & Embryology	80	20	-	-	-	100	UNIVERSITY LEVEL EXAM
	Paper –II A102	Systemic Histology & Gross anatomy	80	20	-	-	-	100	
	A103	Anatomy common Practical	-	-	10	20	20	50	
CC-Physiology	Paper-I A104	Physiological functions of the body	80	20	-	-	-	100	
	Paper –II A105	Physiology of hormonal and regulatory function	80	20	-	-	-	100	
	A106	Physiology common Practical	-	-	10	20	20	50	
Subsidiary subjects									
Compulsory foundation course	A107	Basic computer application	40	10	-	10	-	60	
Discipline specific electives (DSE)	A108	Histology Techniques preparation of slides & stains	40	-	-	-	-	40	
	A109	Museum preparation							
	A110	Electrocardiogram(ECG)							
	A111	Pulmonary Function Test (PFT)							
Compulsory foundation course	A 112	Spoken Kannada	40	-	-	-	-	40	
			400	90	20	50	40	640	

Note: As per the following

1. Proceedings of the 19th meeting of the board of Undergraduate and Post graduate studies in Allied Health Sciences held on 9th February 2018. (Agenda No. AHS/XIX-11/18)
2. 17th meeting of Faculty of Medicine held on 24th February 2018.
3. Proceedings of 31st meeting of Academic council held on 3rd November 2018 (Agenda No. AC/XXXI-02/18)

The two separatephysiology practical with respect to physiology theory paper I & II is modified to single practical.
Similarly the two separate Anatomy practical with respect to Anatomy theory paper I & II is modified to single practical.
The decision is in effect to 2018-19 admission.

Note: 2 In accordance with the decisions taken in the meetings of the 36th Academic council held on 30th Sept. 2020 and 59th Board of Management held on 9th Oct 2020 and as per the notification No.SDUAHER/KLR/ADMN/2732/2020-21 dated 29th March 2021. Conversion of question papers with different weightage in to common weightage and to have Uniform marks in subsidiary subjects.

DETAILS OF THE COURSES

Core courses- Anatomy

1. General Anatomy, General Histology, General Embryology,
2. Gross Anatomy, Systemic Histology

Discipline Specific Elective – Anatomy

1. Histology Techniques preparation of slides & stains
2. Museum preparation

Core courses – Physiology

1. Physiological functions of the body
2. Physiology of hormonal and regulatory function

Discipline Specific Elective Physiology

1. Electrocardiogram (ECG)
2. Pulmonary function Tests

Ability enhancement course

-

Compulsory foundation course

1. Basic Computer Application

FIRST SEMESTER PROGRAM STRUCTURE

Semester	Course Opted	Course Name	Credits
First Semester	**Core courses- Anatomy**	1. General Anatomy, General Histology, General Embryology,	04
		2. Gross Anatomy, Systemic Histology	04
	Discipline specific elective – Anatomy	1. Histology Techniques preparation of slides & stains	01
		2. Museum preparation	01
	Core courses – Physiology	1. Physiological functions of the body	04
		2. Physiology of hormonal and regulatory function	04
	Discipline specific elective Physiology	1. Electrocardiogram (ECG)	01
		2. Pulmonary function Tests	01
	Ability enhancement course	1. Spoken Kannada	01
	Compulsory foundation course	1. Basic Computer Application	03

SEMESTER - I

Course: Anatomy

Paper 1 Title: General Anatomy and Histology

COURSE OUTCOMES

At the end of the course students shall be able to know

	COURESE OUTCOMES (CO)
CO1:	Use correct terminologies to communicate General anatomical features of Human body
CO2:	Comprehend the normal disposition of the various structures and organs in The body with clinical correlations
CO3:	Determine the topography of various structures on the surface of the body
CO4:	Describe the microscopic structure of various tissues
CO5	Identify and locate structures of the body
CO6	Identify organs and tissues under microscope

SEMESTER-I
B.Sc. Allied Health Science Programs (Blood Banking 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
2. Histology of serous, Mucous & mixed salivary glands
3. Histology of 3 types of cartilages,
4. Demonstration of all bones showing parts, radiographs of normal bones & joints.
5. Histology of compact bone (TS & LS)
6. Histology of skeletal (TS& LS), smooth & cardiac muscle
7. Histology of peripheral nerve
8. Demonstration of heart & vessels in the body,
9. Histology of large, medium sized arteries, & Large vein,
10. Histology of lymph node, Spleen, Tonsil & Thymus
11. 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. Lippincott. Philadelphia.
5. Bhatnagar Essentials of Human Embryology –Revised Edition Orient BlackswanPvt.Ltd.
6. B.D.Chaurasia Human anatomy CBS publishers
7. Patrick W.Tank and Thomas R Gest Atlas of anatomy Lippincotwilliams 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

Course: Physiology

COURSE OUTCOMES

At the end of the course, the student shall be able to know

	COURESE OUTCOMES (CO)
CO1:	Use correct terminology to communicate physiological Process /basis Required in the field of allied health care
CO2:	Describe the normal functioning of the organs and systems in the body
CO3:	Comprehend interrelationships, and contribution of among various organs and systems for maintaining homeostasis
CO4:	Variation between normal and abnormal functioning of organs systems
CO5	Acquire knowledge of physiological basis of pathogenesis of disorders.
CO6	have comprehensive knowledge of normal functions of the organ systems of the human body and introduce them to the methods of studying.

SEMESTER-I
B.Sc. Allied Health Science Programs
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& 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 studies	30	**02**	Field visit-	**01**	-	**-**	30	**03**
		Total	180	**09**	240	**07**	120	**03**	540	**20**
Discipline specific electives (DE)	B106 B107	Biochemistry*		1 Basic aspects of research (01) credit 2 Sample collection, preservation and transportation (01 credit)						**01**
	B108 B109 B110	Microbiology*		1. Sterilization and disinfection (01 credit) 2. Antibiotic resistance (01 credit) 3. Specimen collection and transportation (01 credit)						
	B111 B112	Pathology*		1.Phlebotomy (01 credit) 2. Museum Technology (01credit)						
Compulsory foundation course	B 113	Spoken Kannada								**02**
				Grand Total						**23**

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
Core Subjects										
CC Bio chemistry	Paper-I B101	Elementary aspects of biochemistry	80	-	20	100	-	-	-	100
CC Micro biology	Paper-II B102	Elementary microbiology.	80	-	20	100	-	-	-	100
CC Pathology	Paper-III B103	Basics of general ,systemic, clinical, hematology and histopathological technique	80	-	20	100	-	-	-	100
Subsidiary subjects										
Compulsory foundation course (CF)	B104	English for communication	40	-	-	40	-	-	-	40
Ability enhancement course (AEC)	B105	Environmental studies -	40	-	10	50	--	-	-	50
Discipline specific electives (DE)	B106 Biochemistry B107	1. Basic aspects of research 2.Sample collection, preservation and transportation	40	-	-	40	-	-	-	40
	B108 B109 B110	1.Sterilization and disinfection 2.Antibiotic resistance 3.Specimen collection and transportation								
	B111 Pathology B112	Phlebotomy (01 credit) 3.Museum Technology (01credit)								
Compulsory foundation course	B 113	Spoken Kannada	40	-	-	40	-			40
		Total	**400**		**70**	**470**	**-**	**-**	**-**	**470**

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

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

In accordance with the decision taken in the meeting of the 36th Academic council held on 30th Sept. 2020 and as per the notification No.SDUAHER/KLR/ADMN/2687/2020-21 dated 22nd March 2021 The Academy has decided to introduce spoken Kannada classes for 1st& 2nd semesters of Under graduate curriculum as subsidiary / departmental level subject

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 Studies

Compulsory foundation course

2. 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 PROGRAM 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 Studies	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) 2. Museum Technology (01credit)	01

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

SEMESTER -II

Course: Paper-I Biochemistry

COURSE OUTCOMES

At the end of the course students will be able to know

	COURESE OUTCOMES (CO)
CO1:	Know the responsibility of Allied health care personals and hazards encountered in the clinical laboratory
CO2:	Describe the different types, use, care and maintenance of the laboratory apparatus and instruments.
CO3:	Describe the fundamental chemistry and knowledge of different solutions.
CO4:	Define acid, bases, salts, indicators and also explain about acid base balance.
CO5	Explain the management of biomedical waste.
CO6	Explain different methods for disposal of the used samples.

SEMESTER-II
B.Sc. Allied Health Science Programs Syllabus
Subject: Biochemistry
Paper-I
Paper Title: (Elementary aspects of Biochemistry)
Credits (Theory 02, Demonstration 01)

Theory lectures: 40

Unit –I **04hours**

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 **06 hours**

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 **02 hours**

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: **04 hours**

Buffers

Definition, mechanism of action, various types of buffers with example and applications, Preparation of Buffer solutions using pH meter

Unit-7 **02 hours**

Normal values and its interpretations

Unit 8 **06 hours**

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 **05 hours**

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

Unit 10 **04 hours**

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 Programs 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 Na2Co3, 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 orientalBlackswan Pvt. Ltd.
8.Shivarjshankara Y.M Practical Biochemistry
9.Murray R.K harpers Biochemistry Mcgraw Hill
10.PankajNaik Biochemistry Jaypee publication..

SEMESTER –II

Course: Paper-II Microbiology

COURSE OUTCOMES

At the end of the course students will be able to know

	COURESE OUTCOMES (CO)
CO1:	**E**xplainthe structure, classification, and identification of microorganisms including bacteria, fungi, parasite and virus.
CO2:	Describe the mode of transmission, clinical features, and sample collection for identification of disease producing organisms that includes bacteria, fungi, parasite and virus.
CO3:	Describe the different methods of infection control and practices in laboratory and their role in hospital infection control program
CO4:	Describe the various diagnostic tests employed in the laboratory diagnosis of diseases.
CO5	Describe the concepts of Antibiotic sensitivity testing and their role in drug resistance in bacteria.
CO6	Describe the concepts and principles of immunity, hypersensitivity, Autoimmunity, and immunization.

SEMESTER-II
B.Sc. Allied Health Science Programs 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
- Treponemapallidium
- 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

Course: Paper-III Pathology

COURSE OUTCOMES

At the end of the course students will be able to know

	COURESE OUTCOMES (CO)
CO1:	Ability to describe the basic concepts of General pathology, systemic pathology, describe the basics of haematology and blood banking
CO2:	Describe the clinical features and complications of atherosclerosis Hypertensive heart disease
CO3:	Classify and describe the etio-pathogenesis, clinical features of cancer-lung and gastric.
CO4:	Learn about theory of tissue processing and staining techniques
CO5	Classify and describe the etiopathogenesis and morphology of Urinary stones and gall stones
CO6	Collect blood by various methods to efficiently perform routine and special investigations in clinical haematology laboratory

SEMESTER-II

B.Sc. Allied Health Science Programs 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 megaloblasticanaemia

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. RamanicSood, 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 aspects of Biochemistry
2. Applied aspects of Microbiology
3. Applied aspects of Pathology
4. Skill Enhancement Course

   Flow- Cytometer

SEMESTER –III
COURSE OUTCOMES

Paper Title: Applied aspects of biochemistry (clinical chemistry and Laboratory Management)

NO	COURESE OUTCOMES (CO)
CO1	Understand the concept of Blood Glucose regulation and its measurement, interpretation relevant Diabetes mellitus
CO2	Explain the clinical importance of lipids, proteins, lipoproteins their measurement, interpretation in health and disease state.
CO3	Explain different organ functional tests, formation and analysis of renal calculi and gall bladder stone
CO4	Enumerate the different body fluids analysis and their clinical importance
CO5	Ability to understand and describe the concept of advanced biomedical techniques and their applications in clinical laboratory and research
CO6	Understand the concept of medical ethics, quality management, and quality control.

Paper Title: Applied aspects of M**icrobiology**

NO	COURESE OUTCOMES (CO)
CO1	Understand the concept of different types of infections, and methods of infection control in the hospital.
CO2	Describe the molecular biology techniques for diagnosis of various infectious diseases.
CO3	Describe the morphology; classify infection, collection of clinical samples, and culture of fungi in infectious diseases.
CO4	Describe various methods used for bacterial analysis in water, air and milk.
CO5	Ability to understand and describe the concept of advanced biomedical techniques and their applications in clinical laboratory and research

Paper III Title: Applied Aspects of Pathology

NO	COURESE OUTCOMES (CO)
CO1	Describe the methods of Collection, transport, preservation and processing of various Clinical specimens urine, stool, sputum, blood, tissue fluids.
CO2	Describe the methods of collection, physical and chemical examination of Sputum sample
CO3	Describe method of collection, physical, biochemical, microscopic, cytological, Bacteriological examination of CSF. And mention how it is useful in differentiating bacterial, vital and tubercular meningitis.
CO4	Describe the importance of microscopic examination of Pleural fluid, Pericardial, Peritoneal, synovial. And ascetic fluids.
CO5	Describe the pathogenesis of anaemia, haemophilia, thyroid gland disorder, asthma. Encephalomyelitis. Multiple sclerosis infertility, hypersensitivity, pregnancy test
CO6	Have Knowledge about the biomedical waste management

THIRD SEMESTER PROGRAM STRUCTURE

Semester	Course Opted	Course Name	Credits
Third Semester	**Core courses-**	1. Applied aspects of Biochemistry	06
		2. Applied aspects of Microbiology	06
		3. Applied aspects of Pathology	06
	Skill Enhancement course	Flow- Cytometry	03

B.Sc. in Blood Banking Technology Third semester distribution of hours and credits- CBCS scheme

Subject	Paper& Code	Subjects	Theory		Practical		Demonstrations/ assignments		Tutorials		Total	
			hours	**Credits**	hours	**Credits**	hours	**Credits**	hours	**Credits**	Hours	**Credits**
Core course (CC)	Paper-I C101	Applied aspects of biochemistry	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-II C102	Applied aspects of microbiology	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-III C103	Applied aspects of pathology	40	**02**	40	**01**	40	1	40	**02**	160	**06**
AECC	Ability enhancement compulsory course C104	Flow cytometry	30	**03**	-	**-**	-	-	-	**-**	30	**03**
		Total	150	**09**	120	**03**	120	03	120	**06**	510	**21**

B.Sc. in Blood Banking Technology Third 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
Core course (CC)	Paper-I C101	Applied aspects of biochemistry	80	10	20	110	20	20	40	150
	Paper-II C102	Applied aspects of microbiology	80	10	20	110	20	20	40	150
	Paper-III C103	Applied aspects of pathology	80	10	20	110	20	20	40	150
AECC	Ability enhancement compulsory course C104	Flow cytometry	40	-	-	40	-	-	-	40
		Total	**280**	**30**	**60**	**370**	**60**	**60**	**120**	**490**

THIRD SEMESTER PROGRAM STRUCTURE

Semester	Course Opted	Course Name	Credits
Fifth Semester	**Core courses-**	1. Applied aspects of biochemistry	06
		2. Applied aspects of microbiology	06
		3. Applied aspects of pathology	06
	Ability enhancement compulsory course	Flow cytometry	03

SEMESTER-III
B.Sc. in Blood Banking Technology Program Syllabus
Paper I Subject: Biochemistry

Paper Title: Applied aspects of Biochemistry
Credits (Theory 02, Practical 01, Demonstration 01)
SECTION I : CLINICAL BIOCHEMISTRY

Unit 1- Carbohydrates 25 hours

Regulation of blood glucose homeostasis.
Hyperglycaemia: Diabetes mellitus (DM), laboratory findings in type 1 and type 2 DM,gestational DM.
Diagnostic and monitoring criteria for Diabetes Mellitus.
The role of laboratory in differential diagnosis of patients with glucose metabolism alteration

a) Methods of glucose estimation
b) Glucose Tolerance test
c) Glycosylated Hemoglobin
d) Ketones
e) Microalbuminuria
f) Islets antibodies and insulin testing

Unit 2 - Proteins

Plasma proteins in health and disease.
Total protein abnormalities (hypo and hyper proteinemia)
Methods of protein analysis (total protein), electrophoresis, capillary electrophoresis , isoelectric-focussing,, immunochemical method

Unit 3 – Lipids

Classification of lipoproteins based on separation and electrophoretic mobility
Lipid lipoproteins, [lipid profile] estimation and interpretation: a) total cholesterol c)Tri Acyl Glycerol (TAG) d)High Density Lipoprotein (HDL) e)Low Density Lipoprotein (LDL) f) Lipoprotein a (Lpa) g) Apo protein A (Apo A) & Apo Protein B(Apo B)

Unit 4 – Organ function test

Liver function tests(LFT), Renal function tests (RFT), Thyroid function test (TFT), Analysis of calculi-renal & gall-theory of formation and analysis

Unit 5 – Fluids

Fluids different types-Cerebro Spinal fluid (CSF), pleural fluid, ascetic fluid, peritoneal fluid Composition and functions,
Clinical significance of fluid analysis,
Estimation of biochemical component in fluids

Unit 6-Biochemical techniques

- Colorimetry
- Spectrophotometry
- Turbidometry
- Flame photometry
- ISE
- CLIA, ECILA, ELISA, EIA, RIA
- Electrophoresis and chromatography
- Separation and purification of proteins

SECTION II: PRINCIPLES OF LABORATORY MANAGEMENT

Unit 1 - 15hrs

Ethical Principles and standards for a clinical Laboratory professional duty to the patient, duty to colleagues and other professionals, Good Laboratory Practice(GLP), Introduction to Basics of GLP and Aims of GLP.

Unit 2

Quality Management system: Introduction, Quality assurance, Quality control system, Internal and External quality control, quality control chart

Unit 3

Audit in a Medical Laboratory, Introduction and importance, Advantages of Accreditation, Brief knowledge about National and International Agencies for clinical laboratory accreditation, NABL & CAP, Responsibility , Planning , Horizontal , Vertical and Test audit, Frequency of audit, Documentation

Unit 4

Basic concepts of Automation, principle, working and maintenance of various clinical chemistry analyzers, point of care testing.

Unit 5

Biostatistics

Representation of Data: Tabular, Graphical, Measurement of central tendency , Arithmetic mean, mode, median; Measures of dispersion, Range , mean deviation ,variation, standard deviation,standard error, Chi-square test**.**

Practical III semester 40 hours

Experiments

1. Estimation of blood glucose by glucose oxidase peroxidase method
2. Estimation of protein by Biuret method
3. Estimation of serum creatinine by Jaffe's method
4. Estimation of urea in blood sample by DAM method
5. Estimation of Total cholesterol by cholesterol oxidase and peroxidase method
6. Estimation of Triglycerides by GOP/PA method
7. Estimation of HDL Cholesterol by precipitation method
8. Estimation of SGOT in blood sample by kinetic method
9. Estimation of SGPT in blood sample by kinetic method
10. Estimation of alkaline phosphatase in blood sample by kinetic method
11. Demonstration of Estimation of acid phosphatase in blood sample by kinetic method
12. Estimation of bilirubin in blood sample by kinetic method
13. Demonstration of Estimation of Na+, K+ &Ca++ by electrode analyser
14. Estimation of common parameters in urine through use of strips
15. Demonstration of Estimation of T3, T4 and TSH by Electrochemiluminesecence method.

SEMESTER-III
B.Sc. in Blood Banking Technology Program Syllabus
Paper II Subject: Microbiology

Paper Title: Applied aspects of Microbiology
Credits (Theory 02, Practical 01, Demonstration 01)

Unit 1: Sterilization and disinfection

- Autoclave-Principle, uses, Maintenance
- Hot air oven-Principle, uses, Maintenance
- Incubators-Principle, uses, Maintenance

Unit 2: Culture media

- Preparation, Uses, IQC, storage

Unit 3: Biosafety in Microbiology lab

- Biosafety cabinet
- Immunization
- Disease acquired by respiratory route/through blood/through oro-faecal route.
- Personal protective equipments
- Hand hygiene
- Spill management
- Needle stick injury & Post exposure prophylaxis

Unit 4: Diagnostic Microbiology

- Serological tests-Agglutination tests, ELISA, CLIA,
- Molecular Methods-PCR
- Culture methods-Bactec, Biochemical tests, Antibiotic sensitivity testing

Unit 5 : Applied Microbiology

- **Blood Stream infections**

  Sample collection, causative agents.
  Define CLABSI

- **Respiratory tract infections**

  Tuberculosis-update on diagnostic methods
  Pneumonia-Causative agents, sample collection and processing Define VAP
  Diphtheria

- **Urinary tract infection**

  Causative agents, Sample collection and processing
  Define CAUTI

- **Sexually transmitted infections**
  Causative agents, Sample collection and processing
  HIV update
- **Skin and soft infections**
  Causative agents, Sample collection and processing
- **Diarrhoea and Dysentry**
  Causative agents, sample collection and processing

Unit 6: NABL

- Documentation, Critical alerts

Basic aspects of Disaster Management (6 hours)

(In accordance with the decision taken in the meeting of the 38th Academic council held on 2nd June 2021 and as per Notification No.SDUAHER/KLR/ADMN/1207/2021-22 dated 29th Sept. 2021 The Academy has decided to introduce chapter on "Basic aspect of Disaster Management" with weightage of 5 marks during question paper setting)

Definition and types of disaster:

Risk and Vulnerability in Disasters, Natural disasters- earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunami, avalanches, global climate extremes. Man-made disastersTerrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires.

Study of Important disasters:

Earthquakes and its types, magnitude and intensity, seismic zones of India, major fault systems of India plate, flood types and its management, drought types and its management, landside and its managements. Social Economics and Environmental impact of disasters.

Mitigation and Management techniques of Disaster:

Basic principles of disasters management, Disaster Management cycle, Disaster management policy, National and State Bodies for Disaster Management, Early Warming Systems, Building design and construction in highly sesmic zones, retrofitting of buildings.

Training, awareness program:

Training and drills for disaster is preparedness, Awareness generation program, Usages of GIS and Remote sensing techniques in disaster management.

Practical:

40 hours

Experiments

Bacteriology

Staining: Grams, ZN, India Ink Preparation, Albert

Culture media, culture Methods, Antibiotic sensitivity testing

Serology

ASLO, CRP, ELISA, CLIA, Rapid card tests

Mycology

KOH wet mount, LPCB, Slide culture.

Parasitology

Stool Microscopy

Peripheral smear for Malaria Parasite

Reference

1. Text book of Microbiology by Ananthnarayan, 6 th Edition, Orient Longman

2. Diagnostic Microbiology by Bailey & Scott 11th Edition; Mosby

Medical Microbiology by Greenwood & Slack 16th Edition; Churchill Livinstone

3. The Short Textbook of Medical Microbiology by SatishGupte 8th Edition; Jaypee

4. Text book of Medical Parasitology by Panikar 5th Edition; Jaypee

5. Colour Atlas and Textbook of Diagnostic Microbiology by Koneman 5th Edition,

Williams Wilkins

6. District Laboratory in Tropical Countries, Monica Cheesbrough 1st Edition, Cambridge

7. Mackie &Maccarteney Practical Medical Microbiology 14th Edition; Churchill Livingstone

8. Essential Immunology, Roitts& Delves 10th Edition; Blackwel Science

SEMESTER-III
B.Sc. in Blood Banking Technology Program Syllabus
Paper I Subject: Pathology

Paper Title: Applied Aspects of Pathology
Credits (Theory 02, Practical 01, Demonstration 01)

Unit 1- Hematopoiesis

Hematopoiesis, Normal hemoglobin, basic aspects of anemia, classification and types (microcytic,macrocytic, normocytic, hemolytic, pancytopenia) Hemoglobinopathies, Normal leukocyte counts, and their abnormalities, Leukaemoid reactions, Basic aspects of leukemia and classification. Basic aspects of myeloproliferative and myelodysplastic diseases. Basics of hemorrhage disorders, platelets disorders qualitative and quantitative. Coagulation disorder inherited and acquired.
Infections of blood.
Bone marrow examinations: aspiration and biopsy techniques, smear preparation and staining, use of special stain in bone marrow examinations.

Unit 2 – Clinical Pathology

Collection, transport, preservation and processing of various clinical specimens
Urine examination, Physical, chemical and microscopic. Urine analysis by Strip method
Test for haemosiderin pigment.

Renal function tests.Stool examination – collection of specimen of faces
Macroscopic (Naked eye) inspection:
Concentration method ,Flotation method .
Microscopic examination
Chemical examination

Strip method:
Test for Occult blood – Benzidine Test Sputum examination – collection of specimen
Physical examination, Microscopic – Gram's stain, ZiehlNeelsen stain for AFB
Chemical examination

Unit 3 - Immunopathology

Mechanism of Ab- mediated inactivation: direct and indirect
Eg. Diabetes mellitus, thyroid diseases, pernicious anemia, polyendocrinopathy, infertility, haemophilia, myasthenia gravis, anti-idiotypes and diseases.

Immunohaematologic diseases:
Transfusion reactions, erythroblastosis foetails, warm-antibody disesases, cold antibody diseases, drug and hemolytic diseases, agranulocytosis, thrombocytopenic purpura, immune suppression cytotoxic antibodies in vitro.

Immune couples reactions: arthus reaction, serum sickness, evaluation of circulating immune complexes. Atopic anaphyllactic reactions:
reaginic antibody, anaphylaxis, atopic allery –factors involved, asthma, hay fever, food

allergy, insect allergy, atopic eczma, delayed hypersensitivity reactions, contact dematitis, viral infectionss, graft-host relationship in pregnancy.
Autoallergiiic diseases:
encephalomyelitis, multiple sclerosis, oorchitis, thyroiditis, sjogren's syndrome.

Unit 4-Cerebrospinal fluid analysis

Method of obtaining CSF, indications, contra indications.

Examination of CSF:

i. Physical examination
ii. Biochemical examination
iii. Microscopic examination
a. Cytological examination
b. Bacteriological examination

Body fluids:

Microscopic examination of Pleural, Pericardial, synovial, ascitic and peritonial fluid.

Pregnancy Test- Method, interpretation.

Bio-Medical waste: Types, potential risks and their safe management.

Unit -5

Work place based Hazards **06 hours**

(In accordance with the decision taken in the meeting of the 38th Academic council held on 2nd June 2021 and as per Notification No.SDUAHER/KLR/ADMN/1207/2021-22 dated 29th Sept. 2021 The Academy has decided to introduce chapter on "Work Placed Based Hazard" with weightage of 5 marks during question paper setting)

- Definition, different types, description of Biological, chemical, physical, Ergonomic, Psychosocial.
- National Institute for Occupational Safety and Health (NIOSH) standards to prevent work place injuries.
- Hazard Identification and assessment, work place health surveillance, Occupational health indicators, Data sources of Occupational health indicators and Tools, medical surveillance tools,
- Occupational Health records confidentiality of information. Common office hazards, hazards relevant to disciplines (Medical Lab Technology/ Imaging/optometry/ dialysis/ radiotherapy/ cardiac care and perfusion/ respiratory technology at work place. Basic Life support.

Practical 40 hours

Experiments

1. Hemoglobin estimation
2. Peripheral smear preparation and examination , red cell indices calculation,
3. WBC counts, platelets counts, Bleeding time, clotting time, Prothrombin time, Activated partial thromboplastin time.
4. Urine examination, Physical, chemical and microscopic. Urine examination by Strip method
5. Urine Test for haemosiderin pigment. [Demonstration]
6. Benzidine Test- for occult blood
7. Sputum examination - Macroscopic, Microscopic and AFB
8. Histocompatibility testing.
9. Blood grouping &cross matching.
10. Coomb's Test - Direct & Indirect.
11. Setting up of Immunohistochemistry lab.
12. Examination of Cerebrospinal fluid [CSF] and body fluids.
13. Pregnancy Test
14. Examination of Semen.

SEMESTER-IV

Papers

1. Introduction to Blood banking and Blood banking Organization
2. Blood donation and Donor Management
3. Basic Immuno-heamatology and Transfusion transmitted Diseases

Fourth Semester B.Sc. in Blood Banking Technology distribution of hours and credits 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	Introduction to Blood banking and Blood banking organization	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-II D102	Blood donation and donor management	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-III D103	Basic Immunohematology and Transfusion transmitted diseases	40	**02**	40	**01**	40	1	40	**02**	160	**06**
AECC	D105	Constitution of India	30	**02**	-	**-**	-	-	-	**-**	30	**02**
		Total	150	**08**	120	**03**	120	03	120	**06**	510	**20**

B.Sc. in Blood Banking Technology Fourth 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
Core course (CC)	Paper-I D101	Introduction to Blood banking and Blood banking organization	80	-	20	100	-	-	-	100
	Paper-II D102	Blood donation and donor management	80	-	20	100	-	-	-	100
	Paper-III D103	Basic Immunohematology and Transfusion transmitted diseases	80	-	20	100	-	-	-	100
	D104	Common Practical	-	30	-	30	60	10	70	100
AECC	Paper-I D105	Constitution of India	50	-	-	50	-	-	-	50
		Total	**290**	**30**	**60**	**380**	**60**	**10**	**70**	**450**

FOURTH SEMESTER PROGRAM STRUCTURE

Semester	Course Opted	Course Name	Credits
Fourth Semester	**Core courses-**	1. Introduction to Blood banking and Blood banking organization	06
		2. Blood donation and donor management	06
		3. Basic Immunoheamatology and Transfusion transmitted diseases	06
	AECC	Constitution of India	02

SEMESTER -IV

COURSE OUTCOMES

Paper Title: Introduction to Blood banking and Blood banking organization

NO	COURESE OUTCOMES (CO)
CO1:	Understand the basic concepts of hematology.
CO2:	Identify different type of anti-coagulants
CO3:	Understand the complete structure and components of a blood
CO4:	Understand blood and collection of blood sample in detail
CO5:	Understand blood components in detail
CO6:	Various kinds of blood components, methods of preparation, composition of components, storage and cross matching requirements, component modification, special component.

Paper Title: Blood donation and donor management

NO	COURESE OUTCOMES (CO)
CO1:	Acquaint with the format of the taking history of the patient
CO2:	Obtain blood donor's personal detail to select a suitable donor whose blood will be safe for a recipient such as name, father's name, age, address, telephone no., etc. and the questionnaire to access their present and past health status
CO3:	Obtain the medical history esp. history of any previous blood donation, tattoo, needle stick injury etc
CO4:	Check blood donor's hemoglobin level to ensure that he/she is not suffering from anemia and can safely donate a unit of blood
CO5:	Ascertain the medical history and record Donor's weight, blood pressure, pulse and temperature before accepting them as blood donor
CO6:	Defer or reject donor based on the current vitals and medical history example if the donor has taken some unacceptable medicines, vaccinations, or has suffered from some diseases like Hepatitis / jaundice, Heart Disease / surgery, Kidney, liver, lung disease, Abnormal bleeding tendencies, I V Drug use, Cancer, AIDS, or persons involved in high risk activities or groups etc.

Paper Title: Basic Immunoheamatology and Transfusion transmitted diseases

NO	COURESE OUTCOMES (CO)
CO1:	Acquire broad understanding about immuno- hematology and serology
CO2:	Acquaint with cardinal rules of blood grouping ABO, RH and other system of grouping, subgroup A, Bombay blood group and their antibodies.
CO3:	Understand different aspects of blood transfusion techniques and Investigation of transfusion reaction
CO4:	knows to perform compatible test like cross matching and also coombs test
CO5:	Should be able to validate ELISA
CO6:	Able to perform serological test - transfusion transmitted infection

SEMESTER-IV
B.Sc. in Blood banking Technology Program Syllabus
Paper I Subject: Blood banking

Paper Title: Introduction to Blood banking and Blood banking organization
Credits (Theory 02, Practical 01, Demonstration 01)
40 Hours

Unit-I **10 Hours**

History of Transfusion Medicine

- Identify and relate the important features of the history of transfusion medicine
- Outline the scientific benchmarks in the evolution of transfusion medicine-
- Explain how specific innovations affected transfusion medicine practice
- Describe recent trends in the practice of transfusion medicine –
- History of development Transfusion Medicine in India- Whole blood, Components & Apheresis, Recent developments –

Unit-II

Organization of blood bank services **08 Hours**

- Regional blood transfusion center, Blood banks and blood storage centres, Blood Bank premises and infrastructure.
- Mandatory Technical Staffing pattern of blood bank and role, functions and responsibility of each Technical staff.

Unit-III **07 Hours**

Technical requirements:

- Accommodation and environmental conditions, Blood bank management system, Regulations for blood bank operation, Drugs and cosmetics Law, National blood policy, standards in Blood Banking, licensing procedures, ethical aspects of blood transfusion

Unit-IV

Statutory regulators of Blood banking in India- **10 Hours**

- Drug controller of India, State, Director General Health services & NACO.
- Indian Drugs and cosmetic act and rules 1945 pertaining to Blood bank.
- Indian & other Pharmacopeia pertaining to blood products.
- Licensing norms, Inspections and Compliance.
- Terminologies used in blood banking including blood donation.
- Introduction blood and blood products.

Unit-V **05 Hours**

Introduction to Blood bank equipments

- Weights, Volume. Specific gravity, Conversion of weight to volume, Volume dilutions, Weight dilutions etc.
- Etiquette and discipline to be maintained in blood bank-
- Reporting Formats and statistics

Reference Books

1. Modern Blood Banking and Transfusion practices by Denise M Harmening, 5thedition.
2. Transfusion Medicine technical manual-DGHS, Mini Compendium of transfusion medicine, RN Makroo Voluntary blood donation program NACO, Ministry of Health and Family Welfare, Govt. of stry of Health and Family Welfare, Govt. of India, Second edition,2003.
3. Indian Drugs and cosmetic act and rules 1945 pertaining to Blood bank Technical Manual, 17th ed, AABB India, New Delhi,2007.
4. National guide book in blood donor motivation. NACO, Ministry of Health and Family Welfare, Govt. of India.
5. Standards for blood banks and blood transfusion services, NACO, Ministry of Health and Family Welfare, Govt. of India, New Delhi2007.
6. Indian & other Pharmacopeia pertaining to blood products.
7. Indian Drugs and cosmetic act 1945 and Rules 1945 chapter related to Blood Banking

SEMESTER-IV
B.Sc. in Blood banking Technology Program Syllabus

Paper Title: Blood donation and Donor Management
Credits (Theory 02, Practical 01, Demonstration 01)

40 Hours

Unit-I **15 Hours**

Donor Motivation, Motivational Techniques, Social awareness, Preparation of IEC Materials. Blood donation Motivating factors for donation

- Types of blood donors, Donor selection, Donor questionnaire and interview: Eligibility and deferral criteria, medical interview and medical examination
- Pre donation Investigations -haemoglobin estimation & Blood grouping
- Equipments & Reagents used in screening, investigations.
- Managing rejected blood donors, technique for conversion of first time donor into regular voluntary donor, donor felicitation, Donor recruitment & Retention.
- Pre donation & Post donation donor counseling.
- Medico-legal Aspects, NACO & DGHS guidelines.
- Right to information, Donor Consent, reports, Leave letters, certificates

Unit-II **15 Hours**

Blood Donation requisites:

- Blood collection room equipment, their principles, and use, emergency medicines,
- Pre donation counselling, Solutions & Method for Preparing Phlebotomy Site, Test Tube Samples– Method of accurately relating product to donor bleeding of the donor, post donation care.
- Mandatory emergency medicines to be made available and their uses. Donor reactions and their management .
- Screening of blood units for mandatory tests, discarding infected units, post donation counselling.

Unit-III **5 Hours**

Blood Donation drive: Awareness programs prior to blood donation drive, Camp site, staff requirement, management of camp, transportation of blood units from camp site to blood bank.

Unit-IV **5 Hours**

Different types of Blood Collection – Autologous blood donation, Therapeutic Phlebotomy Preservation of donated blood, blood preservation solutions, Additive solutions.

- Blood salvaging.

SEMESTER-IV
B.Sc. in Blood banking Technology Program Syllabus

Paper Title: Basic Immunoheamatology and Transfusion Transmitted diseases
Credits (Theory 02, Practical 01, Demonstration 01)

40 Hours

Unit-I **08 Hours**

Introduction to Immunology, History, Immunity, Cells of immune system: Phagocytic cells, Antigen presenting cells, T cells, T cell subsets, B cells, CD Markers.

- Antigens: Immunogen, allo-antigen, soluble antigen, Red cell antigen, Epitopes immunoglobulins, characteristics of immunoglobulins, Complement System, HLA system.

Unit-II **05 Hours**

Antibodies: Polyclonal anti bodies, development of antibodies, structure of Monoclonal antibodies: Hybridoma technology, Human monoclonal antibodies.

- Antigen antibody reaction: Antigen concentration, antibody concentration, enhancing media, other factors influencing antigen antibody reaction.

Unit-III **02 Hours**

Basic Principles of immuno hematology, application of blood groups, population Genetics.

Unit-IV **05 Hours**

Application of Blood groups: -Population Genetics, Forensic medicine, Transfusion medicine. ABO Blood of Group Systems: History, Genetics, ABH antigens, Biochemical Synthesis of blood group antigens, Antigenic sites, weaker variants, Bombay Phenotype, ABO antibodies.

- Red cell serology techniques, their advantages and disadvantages, Cell and serum grouping, detection of weak A and B antigens, Trouble shooting in red cell serology

Unit-V **05 Hours**

Rh Blood Group System: History, Genetics, Molecular Genetics, Nature of Rh Antigens, Partial D, Weak D, other variants of Rh, Rh Null, Rh antibodies factors influencing Rh immunization, Functional role of Rh antigens.

Unit-VI **08 Hours**

Other Blood Group Systems: Lewis, P, Ii, MNSs, Kell, Duffy, Celano, In, Private antigens, Public antigens.

- Principles of Direct and indirect antiglobulin test technique, Weak Rh D Typing.
- Antenatal Serology, Hemolytic disease of the newborn due to ABO Incompatibility, Rh Incompatibility and other allo-antibodies
- Pre transfusion testing - Patient specimen labelling requirements, Patient / component identification requirements.

- Different methods of cross matching, Saline Cross match, Saline replacement for rouleaux, enzyme technique, albumins technique, anti-globulin cross-matching.
- Cross matching in special circumstances, emergency cross matching, electronic cross matching. Abbreviation of compatibility testing in emergency. Micro plate techniques
- Study of major transfusion transmitted infection caused by viruses, Pathology, epidemiology Hepatitis B, Hepatitis C , Human immunodeficiency viruses 1 and 2, HTLV viruses I and II, and West Nile virus (WNV).Implication of the other viral diseases for blood transfusions: Epstein-Barr virus, cytomegalovirus (CMV), parvovirus B19 and Creutzfeldt-Jakob disease .

Unit-VII **07 Hours**

Transfusion associated parasites – Malaria & others. Syphilis and other pathogens. Malaria and syphilis by various methods and understand principles of testing. Understand and be able to interpret non treponemal and treponemal antibody tests used to diagnose syphilis. Transfusion associated infections with other bacterial / fungal / protozoal infections.

- Basic principles of ELISA test, various types of ELISA, Laboratory screening tests for TTI, Spot tests, Limitation of various tests.
- Quarantine and recipient tracing, procedures for look-back and recipient follow-up.
  - Compare & contrast various methodologies such as ELISA, rapid & chemiluminescence used in screening of transfusion transmitted infections.National policy on TTI testing of blood donors.
  - Chemiluminence, NAT, Western Blot, Automation in blood donor TTI screening. Confirmatory tests for TTI testing.
  - Demonstrate proficiency in the preparation and use of internal control in transfusion transmitted infection screening.
  - Quality control and documentation.Proficiency testing – IQUAS & EQUASPathogen reduction, Cellular components and plasma components.
  - Discard of Blood Parts and Documentation of records, Universal precautions –Bio waste management.
  - Disposal of Reactive Bags, its components. Demonstrate proficiency in proper disposal of bio hazardous material as per recommended standards.

a) Practicals - IV semester:

- Preparation of phlebotomy site.
- Operation of blood collection monitor, tube sealer and needle burner.
- Donor Room Protocol, Donor Screening Qualifying Test For Blood Donation-Laboratory investigations
- Donor Suitability / Selection
- Selection Of Bags For Collection Of Blood
- Blood Collection – Solutions & method For Preparing Phlebotomy Site

- Test Tube Samples – arrangement and requirement
- Blood Collection – Method Of Accurately Relating Product To Donor
- Blood Collection Procedure
- Post Blood Donation Care
- Post donation instructions
- Management Of adverse reaction
- Determination of ABO & Rh Blood Group(Reverse & Forward)–Tube method & CAT method
- Preparation of 3-5% Red Cell Suspension
- Reading, Grading and Recording Results
- Performing Direct Anti-globulin Test & Indirect Antiglobulin Test
- Saline cross match
- Performing Anti-globulin Cross-Match
- Anti A and anti B titer estimation
- Weak D testing
- Identification of antiseras
- CLIA & ELISA for HBsAg, HIV,HCV & Syphilis detection.
- Rapid tests for HIV, HCV, HBsAg, Malaria and Syphilis detection.
- RPR test for Syphilis.
- Biomedical waste management exercises

SEMESTER-V

Papers

1. Blood Components, preparation and Component therapy
2. Transfusion therapy & Blood bank equipment's
3. Quality Control and Documentation
4. Skill enhancement course : Medical Ethics

SEMESTER -V

COURSE OUTCOMES

Paper Title: Blood Components, preparation and Component therapy

NO	COURESE OUTCOMES (CO)
CO1:	Interpret immune hematological tests.
CO2:	Provide consultation to physicians regarding transfusion management
CO3:	Provide opinion for difficult transfusions, incompatibility work up, therapeutic plasma apheresis irradiated blood therapy, stem cell procedures, platelet rich plasma therapies, HLA and cord blood banking.
CO4:	Give knowledge of immunohematology and its application to ensure safe transfusion practices.
CO5:	Give advanced study of immunological principles in diagnostic testing; problems and Solutions to compatibility testing for blood components
CO6:	Give advanced study of immunological principles in diagnostic testing; problems and Solutions to compatibility testing for blood components

Paper Title: Transfusion therapy & Blood bank equipment's

NO	COURESE OUTCOMES (CO)
CO1:	Understand the conditions when blood transfusion is required
CO2:	Identify the blood requirements of a patient, and the minimum information required to correctly identify the blood product
CO3:	Immediately respond to the demand of a blood for transfusion
CO4:	Ensure timely collection of correct blood product from the storage area
CO5:	Check and verify the details of the blood with the patient requirements before issuing out the blood
CO6:	Assist in patient monitoring during blood transfusion, if required, Understand the judicious use of blood

Paper Title: Quality Control and Documentation

NO	COURESE OUTCOMES (CO)
CO1:	Understand the significance of quality, perception & its dimension
CO2:	Understand the significance of attending CME's for technician
CO3:	Develop a 3broad understanding regarding-Hospital Information System, Quality Improvement Plan, Total Quality Management
CO4:	Differentiate between quality control and assurance
CO5:	Understand the factors which influences quality of care

B.Sc. in Blood Banking Technology Fifth semester 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	Blood components, preparation and component therapy	40	**03**	40	**01**	40	1	40	**02**	160	**07**
	Paper-II E102	Transfusion therapy & Blood bank equipment	40	**03**	40	**01**	40	1	40	**02**	160	**07**
	Paper-III E103	Quality control and Documentation	40	**02**					40	**02**	160	**04**
Skill enhancement course (SEC)	E205	Medical Ethics	30	**02**	-	**-**	-	-	-	**-**	30	**02**
		Total	150	**08**	120	**03**	120	03	120	**06**	510	**20**

B.Sc. in Blood Banking Technology Fifth 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
Core course (CC)	Paper-I E201	Blood components, preparation and component therapy	80	-	20	100	-	-	-	100
	Paper-II E202	Transfusion therapy & Blood bank equipments	80	-	20	100	-	-	-	100
	Paper-III E203	Quality control and Documentation	80	-	20	100	-	-	-	100
	E104	Common Practical	-	30	-	30	60	10	70	100
Skill enhancement course (SEC)	E205	Medical Ethics	50	-	-	50	-	-	-	50
		Total	**340**	**30**	**60**	**430**	**60**	**10**	**70**	**450**

FIFTH SEMESTER PROGRAM STRUCTURE

Semester	Course Opted	Course Name	Credits
Fifth Semester	**Core courses-Pathology**	1. Blood components, preparation and component therapy	06
		2. Transfusion therapy & Blood bank equipment's	06
		3. Quality control and Documentation	06
	Skill enhancement course (SEC)	Medical Ethics	02

SEMESTER-V
B.Sc. in Blood Banking Technology Program Syllabus
Paper Title: Blood components, preparation and component therapy
Credits (Theory 02, Practical 01, Demonstration 01)

40 Hours

Basic steps in component preparation & labeling.

- Composition & storage Composition: volume, cellular, plasma and clotting factor content.
- Equipments used for component preparation.
- Selection of blood bags for component preparation.
- Care and precautions to be taken during whole blood collection and before component preparation.
- Programming for component preparation, PRP & Buffy coat methods & Other methods of component preparation.
- Preparation of red cell concentrate, Fresh Frozen plasma, other plasma products platelet concentrate, cryoprecipitate, washed red cells.
- Plasma Fractionation: Principles, manufacturing of different plasma derivatives.
- Storage conditions for components "Storage lesions"- Metabolic changes in blood components during storage, release of cytokine during storage.
- Component Testing, Labeling, Transportation and storage of blood components.
- Inventory management and maintenance of blood stock
- Modified blood components: Preparation of leukoreduced blood products, Leukocyte filters, Irradiated blood components, Blood substitutes, Washed /plasma reduced blood components, frozen red cells.
- Specialized blood components –CMV free and HLA matched & Blood substitutes, Recombinant clotting & hematopoietic growth factors.
- Quality control of components: Measurement of factor VIII level in FFP, Measurement of fibrinogen level in FFP, Measurement of pH and other platelet parameters, Sterility test on platelet concentrates, Sterility test on whole blood and Packed red blood cell concentrate.
- Plasma fractionation products & Pathogen inactivation methods.
- Management of Blood Bank Issue Counter, Criteria for acceptance of requisition form.
- Inspection and selection of blood component.

SEMESTER-V
B.Sc. in Blood Banking Technology Program Syllabus
Paper Title: Transfusion therapy and Blood bank equipments
Credits (Theory 02, Practical 01, Demonstration 01)

40 Hours

- Plan for transfusion. Criteria for issue of blood and blood Components.
- Use red cell components in of different types of anemia, Use of blood components in bleeding patient, Neonatal transfusion, and Transfusion practices in surgery, Selection of units for cross matching,
- Transfusion therapy for oncology and Transplantation patients.
- Transfusion indications Red blood cells, Platelets, Plasma / cryoprecipitate, Granulocytes.
- Pre Transfusion strategies in special cases regarding samples, techniques and protocols in special patients circumstances -Paediatric / neonatal, Obstetric including intra uterine, cardiac surgery , burn patients & trauma patients.
- Blood administration, transfusion filters, post transfusion care, maximal surgical blood order schedule.
- Immune haemolytic anaemia, warm & cold type, drug induced haemolytic anaemia.
- Thrombocytopenia Immune thrombocytopenic purpura. Thrombotic thrombocytopenic purpura. Post transfusion purpura.
- Fetal and neonatal thrombocytopenia.
- Granulocyte transfusion.
- Platelet refractoriness Recognition and evaluation.
- Calculation of CCI and platelet recovery
- Transfusion reactions Diagnosis, Pathophysiology, Investigations.
- Hemolytic transfusion reaction - immediate and delayed; immune and non-immune reaction path physiology; Clinical signs and symptoms and laboratory investigation for HTR, Transfusion reaction work up.
- Non- hemolytic transfusion reactions Immediate and delayed, bacterial contamination, febrile reaction, Allergic reaction, Transfusion related lung injury, PTP, Alloimmunization, Iron overload, Graft versus host disease.
- Current risk & Prevention strategies of transfusion reactions and rational use of blood components.
- General Lab equipments
- Colorimeters & Elisa readers, washers
- Thermometers

- Weighing devices
- Refrigerators
- Platelet agitators & Incubators
- Deep freezers
- Thawing bath & devices
- Plasma expressers
- Sterile connecting devices
- Apheresis equipments
- Computers
- Software & Hardware
- Temperature regulating devices (Incubators, Hot air oven)
- Autoclaves
- Cell washers
- HIS
- Automation platforms
- Blood serology: Various reagents & Kits ordering, specifications & Documentation
- TTI Kits- Ordering, specifications and documentation

Medical Law and Ethics (06 hours)

(In accordance with the decision taken in the meeting of the 38th Academic council held on 2nd June 2021 and as per Notification No.SDUAHER/KLR/ADMN/1207/2021-22 dated 29th Sept. 2021 The Academy has decided to introduce chapter on "Basic Law for Allied Health care professionals" with weightage of 5 marks during question paper setting)

Introduction to medical Law and ethics : Introduction to Code of conduct, Basic principles of medical ethics Confidentiality, Malpractice and negligence - Rational and irrational drug therapy, Autonomy and informed consent - Right of patients, Care of the terminally ill- Euthanasia, Organ transplantation, **Medico legal aspects of medical records** –Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records. Professional Indemnity insurance policy, development of standardized protocol to avoid near miss or sentinel events. Obtaining an informed consent. Consideration of medical ethics – Doctors, patient and profession.

SEMESTER-V
B.Sc. in Blood Banking Technology Program Syllabus

Paper Title: Quality Control and Documentation
Credits (Theory 02, Practical 01, Demonstration 01)

40 Hours

- Quality control, assurance and management systems.
- Quality control of empty blood bags. Quality control of different blood bank Components, sterility test on component.
- Quality control of blood bags, Quality Assurance Hb &PCV, Quality control of blood grouping reagents, QC of anti-human globulin reagent, bovine albumin, Normal saline, Antisera etc., QC of TTI test kits – ELISA,CLIA & Rapid
- Quality control of all equipments, Calibration, validation and maintenance of blood bank equipment.
- QC of blood bank techniques Quality Assurance - Temperature Records, Sterility Testing. Internal QC and External QC
- Quality parameters of various blood components, Quality Assurance blood components – red cells, FFP, cryoprecipitate, platelets, Red Cell and WBC contamination.
- Calibration, validation and maintenance of blood bank equipment, QC of blood bank technique.
- Documents, Registers, Records & Formats to be kept. Licensing, Drug authorities' inspection and compliance.
- Registers forms, Documentation and Standard operating procedures (SOP or GMP), Blood bank management system, Regulations for blood bank operation, Drugs and cosmetics Law, National blood policy, standards in Blood Banking, licensing procedures, ethical aspects of blood transfusion.
- Hospital Transfusion Committee. Blood Bank Accreditation- . ISBT, NABL, NABH standards and accreditation.
- Legal and ethical aspects, Regulatory Acts, Bio hazard Waste Disposal Act, National blood policy.

Practical's Semester-V

- Refrigerated centrifuge operation, various programs for preparing of blood components
- Preparation of packed red cells
- Preparation of FFP
- Preparation of Washed Packed cells
- Preparation of Cryoprecipitate and Cryo depleted plasma
- Preparing random donor platelets
- Operation of Laminar Flow
- Leukodepletion of red cells
- Leukodepletion of platelets
- Learning blood component separation-Buffy Coat Method
- Quality control of Components
- Operation and principle of Apheresis Machine
- Therapeutic Plasma Exchange
- Peripheral Stem Cell collection
- Irradiation

Reference Books:

1. Textbook of Medical Physiology by G.K. Pal.
2. Review of Medical Physiology by Ganong.
3. Medical laboratory Procedure Manual (T-M) by K.L. Mukherjee 1987, Vol.I, II & III Tata McGraw Hill Publication.
4. Text book of Medical Biochemistry by Ramakrishna
5. Clinical Chemistry - Principle and techniques by RJ Henry, Harper & Row Publishers.
6. Text Book Biochemistry by Vasudevan and Sree Kumari
7. Basic Pathology by Robbins
8. Basic laboratory procedures in clinical bacteriology, Ist Edition, J P Brothers, New Delhi
9. Textbook of Microbiology for nurses. C.P.Baveja. 2009. Third edn
10. Modern Blood Banking and Transfusion practices by Denise M Harmening, 5th edition
11. Transfusion Medicine technical manual-DGHS, Ministry of Health and FamilyWelfare, Govt. of India, Second edition, 2003

VI semester

Papers

1. Advanced Immunohematology and Immunology
2. Apheresis and Autologous Transfusion
3. Advances in Transfusion Medicine
4. Ability Enhancement compulsory course
   Biosafety and Biomedical Waste Management

SEMESTER -VI

COURSE OUTCOMES

Paper Title: Advanced Immunohematology and Immunology

NO	COURESE OUTCOMES (CO)
CO1:	Able to interpret immune hematological tests
CO2:	Able to provide consultation to physicians regarding transfusion management
CO3:	Able to provide opinion for difficult transfusions, incompatibility work up, therapeutic plasma apheresis irradiated blood therapy, stem cell procedures, platelet rich plasma therapies, HLA and cord blood banking.
CO4:	knowledge of immunohematology and its application to ensure safe transfusion practices
CO5:	Advanced study of immunological principles in diagnostic testing; problems and Solutions to compatibility testing for blood components

Paper Title: Apheresis and Autologous Transfusion

NO	COURESE OUTCOMES (CO)
CO1:	Should be able to perform the procedure independently, obtain quality product and manage any adverse effects
CO2:	Should be able to select proper patient, machine, plan TPE, select replacement fluids and monitor the patient
CO3:	Able to improve quality and functional capacity of each component
CO4:	Able to use the optimal products for specific diseases
CO5:	Understand the principles of apheresis technology, including centrifugation, filtration, and immune adsorption.

Paper Title: Advances in Transfusion Medicine

NO	COURESE OUTCOMES (CO)
CO1:	Able to understand recent trends in transfusion medicine like Donor screening, retention, Blood collections, components etc.
CO2:	To know Recent advances in Automation of Blood Banking
CO3:	To perform Stem cell, Cord blood, Peripheral blood, Haematopoietic stem cell banking and application
CO4:	Cryopreservation, Quality Control and thawing procedures in stem cell banking.
CO5:	To perform Operation of Apheresis Machine, Therapeutic Plasma Exchange, Peripheral Stem Cell collection and Irradiation

B.Sc. in Blood Banking Technology Sixth semester distribution of hours and credits- CBCS scheme

Subject	Paper& Code	Subjects	Theory		Practical		Demonstrations/ assignments		Tutorials		Total	
			hours	**Credits**	hours	**Credits**	hours	**Credits**	hours	**Credits**	Hours	**Credits**
Core course (CC)	Paper-I F101	Advanced Immunohematology and Immunology	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-II F102	Apheresis and Autologous Transfusion	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-III F103	Advances in Transfusion Medicine	40	**02**	40	**01**	40	1	40	**02**	160	**06**
AECC	Ability enhancement compulsory course F105	Biosafety and Biomedical Waste Management	30	**03**	-	**-**	-	-	-	**-**	30	**03**
		Total	150	**09**	120	**03**	120	03	120	**06**	510	**21**

B.Sc. in Blood Banking Technology Sixth 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
Core course (CC)	Paper-I F101	Advanced Immunohematology and Immunology	80		20	100				100
	Paper-II F102	Apheresis and Autologous Transfusion	80		20	100				100
	Paper-III F103	Advances in Transfusion Medicine	80		20	100				100
	F104	Common Practical	-	30	-	30	60	10	70	100
AECC	Ability enhancement compulsory course F105	Bio-safety and Biomedical Waste Management	40	-	-	40	-	-	-	40
		Total	**280**	**30**	**60**	**400**	**60**	**10**	**70**	**440**

SIXTH SEMESTER PROGRAM STRUCTURE

Semester	Course Opted	Course Name	Credits
Fifth Semester	**Core courses-**	1. Advanced Immunohematology and Immunology	06
		2. Apheresis and Autologous Transfusion	06
		3. Advances in Transfusion Medicine	06
	Ability enhancement compulsory course	Biosafety and Biomedical Waste Management	03

SEMESTER-VI
B.Sc. in Blood Banking Technology Program Syllabus

Paper Title: Advanced Immunohematology and Immunology
Credits (Theory 02, Practical 01, Demonstration 01)

40 Hours

Unit 1: Interpretation of ABO grouping: Other Blood Group Systems 10 Hours

- Solving ABO and Rh grouping discrepancies Subgroups of ABO
- Polyagglutination.
- Other Blood Group Systems Lewis, P, Ii, MNSs, Kell, Duffy, Celano, In, Private antigens and Public antigens, Antibody identification
- Use of enzymes in blood banking, potentiators and special reagent in blood grouping and cross matching, Investigation of autoimmune
- Hemolytic anemia.

Unit 2 : Antibody screening 09 Hours

- Antibody identification- 11 cell & extended cellpanel.
- Detection of blood group antibodies, identification of their Specificity, Clinical significance of antibody detection,
- Differentiation between auto and allo-antibodies Gel Technology
- Antenatal Serology
- Rh Incompatibility and other allo-antibodies Kleihauer test
- Erythrocyte resetting test and other tests**.**

Unit 3: Preparation Red Cell panels 05 Hours

- Elution & Adsorption Procedures.
- Reagents used in advanced immunohematology.
- Cryopreservation & thawing techniques of cell Panels and Red blood cells

Unit 4: Newer techniques in Blood bank 05 Hours

- Gel technology and Plate technology,
- Virtual Cross match and Molecular blood grouping Automaton in blood grouping
- Saliva testing

Unit 5: Advanced Immunology 05 Hours

- General principles of Immunology and Complement System
- HLA System:
- HLA antigens HLA antibodies HLA Serology
- HLA phenotyping and

- Various Histocompatibility matching procedures-CDC,ELISA, chemiluminescence and Flow cytometry methods
- Molecular methods:
- Molecular methods in Immunology.
- Establishment of HLA lab for transplantation of organs

Basic aspects of Disaster Management (6 hours)

(In accordance with the decision taken in the meeting of the 38th Academic council held on 2nd June 2021 and as per Notification No.SDUAHER/KLR/ADMN/1207/2021-22 dated 29th Sept. 2021 The Academy has decided to introduce chapter on "Basic aspect of Disaster Management" with weightage of 5 marks during question paper setting)

Definition and types of disaster: Risk and Vulnerability in Disasters, Natural disasters- earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunami, avalanches, global climate extremes. Man-made disastersTerrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires.

Study of Important disasters: Earthquakes and its types, magnitude and intensity, seismic zones of India, major fault systems of India plate, flood types and its management, drought types and its management, landside and its managements. Social Economics and Environmental impact of disasters.

Mitigation and Management techniques of Disaster: Basic principles of disasters management, Disaster Management cycle, Disaster management policy, National and State Bodies for Disaster Management, Early Warming Systems, Building design and construction in highly sesmic zones, retrofitting of buildings.

Training, awareness program: Training and drills for disaster is preparedness, Awareness generation program, Usages of GIS and Remote sensing techniques in disaster management.

Practicals:

1. Testing saliva for A, B and H antigens
2. Confirming anti-A1 in an A2 or weak A subgroup
3. Testing for weak D
4. Immediate spin compatibility testing
5. Detecting antibodies to red cell by indirect antiglobul in test
6. Saline indirect antiglobulin test
7. LISS additive indirect antiglobulin test
8. Preparation red cell panels

SEMESTER-VI
B.Sc. in Blood Banking Technology Program Syllabus

Paper Title: Apheresis and Autologous Transfusion
Credits (Theory 02, Practical 01, Demonstration 01)

40 Hours

Unit –I 20 Hours

Apheresis

- Apheresis procedures, Apheresis products, Maintenance of cell separator equipment.
- Apheresis products, preparation of multiple products on cell separators-
- Plateletpheresis,
- Plasmapheresis (Single donor & TPE),
- Leukapheresis (Granulocyte & Peripheral hematopoietic blood stem)

Unit –II 20 Hours

Autologous Blood Transfusion:

- Define, Principle and different methods of Autologous Blood Transfusion
- Predeposit autologous donation
- Acute normovolaemic haemodilution
- Interoperative and postoperative blood salvage
- Risks & management of autologous blood transfusion

SEMESTER-VI
B.Sc. in Blood Banking Technology Program Syllabus

Paper Title: Advances in transfusion Medicine
Credits (Theory 02, Practical 01, Demonstration 01)

40 Hours

Advances in transfusion Medicine

Unit –I 10 Hours

Latest trends in blood banking- Donor screening, retention, Blood collections, components etc.
Recent advances in Automation of Blood Banking.

Unit-II 05 Hours

Nucleic Acid Testing. Stem Cells & Cord stem cell banking.

Unit-III 10 Hours

Stem cell- Cord blood, Peripheral blood, Haematopoietic stem cell and Stem cell banking and application.
Procedures of collection of stem cell and calculation of stem cell collected.

Unit-IV 05 Hours

Quality control of products.

Unit-V 10 Hours

Cryopreservation, maintenance, QC and thawing procedures in stem cell banking.
Regenerative medicine.

Practicals – VI semester

1. Operation and principle of Apheresis Machine
2. Therapeutic Plasma Exchange
3. Peripheral Stem Cell collection
4. Irradiation

Reference textbooks:

1. Modern Blood Banking and Transfusion practices by Denise M Harmening, 5th edition
2. Transfusion Medicine technical manual-DGHS, Ministry of Health and Family Welfare, Govt. of India, Second edition,2003
3. Indian Drugs and cosmetic act and rules 1945 pertaining to Blood bank AABB Technical Manual, 17th ed, AABB
4. Compendium of transfusion medicine, RNMakroo
5. Practical Hematology, J A Dacie and S MLewis
6. Basic Immunology, A K Abbas and A H Lichtman. Second ed, Saunders Elsevier.
7. Essential Immunology. I Roitt, 8th ed, Blackwell scientific publications
8. Basic molecular and cell biology. David Latchman. BMJ Publishing group, 1997.
9. Standards for blood banks and blood transfusion services, NACO, Ministry of Healthand Family Welfare, Govt. of India, New Delhi 2007
10. Indian & other Pharmacopeia pertaining to blood products

Other References of interest Books:

1. Textbook of Medical Physiology by G.K. Pal.
2. Review of Medical Physiology by Ganong.
3. Medical laboratory Procedure Manual (T-M) by K.L. Mukherjee 1987, Vol.I, II & III Tata McGraw Hill Publication.
4. Text book of Medical Biochemistry by Ramakrishna
5. Clinical Chemistry - Principle and techniques by RJ Henry, Harper & Row Publishers.
6. Text Book Biochemistry by Vasudevan and Sree Kumari
7. Basic Pathology by Robbins
8. Basic laboratory procedures in clinical bacteriology, Ist Edition, J P Brothers, New Delhi
9. Textbook of Microbiology for nurses. C.P.Baveja. 2009. Third edn
10. Modern Blood Banking and Transfusion practices by Denise M Harmening, 5th edition
11. Transfusion Medicine technical manual-DGHS, Ministry of Health and FamilyWelfare, Govt. of India, Second edition, 2003
12. Blood transfusion in clinical medicine by PL Mollison
13. AABB Technical Manual, 17th ed, AABB
14. Compendium of transfusion medicine, RN Makroo
15. Practical Hematology, J A Dacie and S M Lewis
16. Basic Immunology, A K Abbas and A H Lichtman. Second ed, Saunders Elsevier.
17. Essential Immunology. I Roitt, 8th ed, Blackwell scientific publications
18. Basic molecular and cell biology. David Latchman. BMJ Publishing group, 1997.
19. Voluntary blood donation program NACO, Ministry of Health and Family Welfare, Govt. of India, New Delhi, 2007.
20. National guide book in blood donor motivation. NACO, Ministry of Healthand Family Welfare, Govt. of India.
21. Standards for blood banks and blood transfusion services, NACO, Ministry of Health and Family Welfare, Govt. of India, New Delhi 2007

Note: Students of Blood banking technology must learn the basic principles about equipment, components, hands on usage, quality control and preventative maintenance compulsorily as value addition.

He / She shall perform the blood banking instruments like

Hematology Analyzers

- Blood cell counter/ Blood cell counter
- Coagulation Analyzer
- Hem cytometer

Blood Bank Analyzers

- Blood Bank Centrifuge
- Platelet Agitator
- ELISA Reader with washer
- Chemiluminescence Analyzer
- Cry bath
- Platelet Incubator
- Plasma extractor
- Blood Roller mixer
- Blood bag tube sealer
- Blood Collection monitor

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

THEORY

Subjects having maximum marks = 80			Total
Type of question	Number of questions	Marks for Each question	
Long Essay	02	10	20
Short essay	06	5	30
Short answer	10	3	30
		Total	80

For the papers which has section A & B and already existing stand alone papers

Subjects having maximum marks = 40			Total
Type of question	Number of questions	Marks for Each question	
Long Essay	01	10	10
Short essay	03	5	15
Short answer	05	3	15
		Total	40

Note: In accordance with University notification No.SDUAHER/KLR/ADMN/2732/2020-21, dated 29.03.2021 based on proceedings of the 36th meeting of the Academic council held on 30.09.2020 and also proceeding of the 59th meeting of the Board of Management held on 09.10.2020 approve the subject of Conversion of Question papers with different weightage of Allied Health Science programs to common weightage to facilitate Question bank generation and also to have uniform marks in subsidiary subjects)

-End-