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
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(With effect from 2016-17 batches)

Choice Based Credit System Based Graduate Curriculum for Bachelor of Science in Ophthalmic Technology and Optometry

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

Approved as per BOM-41-2016,(Resolution No-XLI-05(3)/16) Dated-19/10/2016

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
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REGULATIONS GOVERNING

THE BACHELOR OF SCIENCE (B.Sc.)

DEGREE

UNDER CHOICE BASED CREDIT SYSTEM

2016

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

CHOICE BASED CREDIT SYSTEM IN ALLIED HEALTH SCIENCES

INTRODUCTION

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

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

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

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

DEFINITIONS OF KEY WORDS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

B.Sc. PROGRAMS STRUCTURE

Semester	Program structure
I	Basic medical sciences Common to all disciplines as mandatory core courses (CC), 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

2. DURATIONS

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

3. CALENDAR OF EVENTS

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

4 ELIGIBILITY FOR ADMISSION

A Candidate seeking admission to B.Sc. program

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

OR

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

OR

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

OR

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

OR

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

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

5 LATERAL ENTRY

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

6 ATTENDANCES

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

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

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

7. MAXIMUM PERIOD FOR COMPLETION OF THE PROGRAMS

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

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

9. TEMPORARY DISCONTINUATION OF THE PROGRAM

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

10. HOURS OF INSTRUCTION PER WEEK

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

11. COURSE PATTERN

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

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

12. THE SCHEME OF EXAMINATION

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

13. INTERNAL ASSESSMENT

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

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

14. REGISTERING FOR THE EXAMINATIONS

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

15. VALUATION OF ANSWERSCRIPTS

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

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

16. RESULTS CLASSIFICATION OF SUCCESSFUL CANDIDATES

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

Table 1: Final Result/Grades Description

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

Table 2 point grading system with letter grade

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

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

17.1 Calculation of SGPA

The following procedure to compute the Semester Grade Point Average

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

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

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

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

Example for SGPA (20 Credits)

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

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

Classification of Result **:** First Class

Illustration for SGPA

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

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

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

Semester Alpha Sign Grade: **B**

17.2 Calculation of CGPA

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

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

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

Example for CGPA

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

ILLUSTRATION I

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

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

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

Illustration for CGPA

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

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

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

CGPA 7.56 A (very good) First class with distinction

18. TRANSCRIPT (SCORE CARD /MARKS SHEET) FORMAT

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

19. MINIMUM FOR A PASS

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

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

20. GRACE MARKS

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

21. CARRY OVER PROVISION

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

22. REVALUATION

There is no revaluation permissible in the regulation

23. POWER TO REMOVE DIFFICULTIES:

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

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

a)

PREVIEW ONLY, NOT FOR PRINTING

GRADE CARD

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

Register Number : 17IMT001

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

Sl. No.	Subject / Paper		Theory / Practical		I.A. / Viva		Total		Cr. Hrs.	Gr. Pts.	Cr. Pts.	Remarks
			Max.	Sec.	Max.	Sec.	Max.	Sec.				
	Core Course											
01	**Anatomy-I :** General Anatomy, Histology and Embryology	Th. 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	

SDUAHER

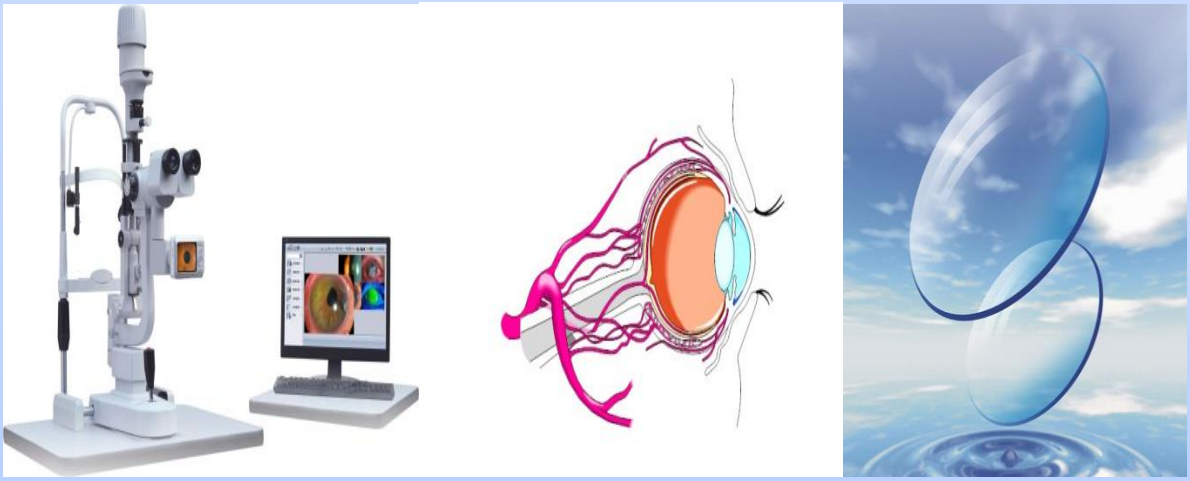
SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH

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

BACHELOR OF SCIENCE (B.Sc.)

In Ophthalmic Technology

2016



SYLLABUS UNDER

CHOICE BASED CREDIT SYSTEM

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH

KOLAR KARNATAKA

SDUAHER

Adoption of Choice based credit system for Bachelor of Science in Allied Health Science Programme

B.Sc. Ophthalmic Technology

UNDER FACULTY OF ALLIED HEALTH SCIENCES

As per University Grants Commission

2016-17

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 POSTERITY**"

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 programmes 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 programmes 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
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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 Medical laboratory 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

Structure of B.Sc. Ophthalmic Technology Programme 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	-	-	-	Basic Computer Application
II	5.Biochemistry 6.Microbiology 7.Pathology	DSE-1 DSE-2 DSE-3 DSE-4 DSE-5 DSE-6	Environmental science	-	-	English communication
III	8 Ocular Anatomy & Ocular Physiology 9. Ocular Microbiology & Ocular Biochemistry 10. Physical & Physiological Optics			SEC-1 (SAFE-I)	-	-
IV	11. Clinical Pathology Ocular Pharmacy and Pharmacology 12. Refraction Investigative Ophthalmology 13. Ophthalmic instruments and appliances		Constitution of India	-	-	-
V	14. Clinical and Advanced orthoptics 15. Clinical and advanced optics 16. Contact lens and eye bank			SEC-2 Medical Ethics	-	-
VI	17. Community Ophthalmology 18. Investigations in Clinical Ophthalmology 19. Management of OT	-	Quality control	-	-	-
VII	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 A103	Physiological functions of the body	30	**02**	30	**01**	30	**01**	90	**04**
	Paper –II A104	Physiology of hormonal and regulatory function	30	**02**	30	**01**	30	**01**	90	**04**
CF-Compulsory foundation course	A105	Basic computer application	30	**02**	30	**01**	-	**-**	60	**03**
		Total	170	**11**	150	**05**	120	**04**	440	**19**
	A106 A107	Discipline specific electives (DSE)	Anatomy*	1 Histology Techniques preparation of slides & stains (01 credit) 2 Museum preparation (01 credit)						**01**
	A108		Physiology *	1 ECG (01 credit)						
	A109			2 Pulmonary function test (01 credit)						
				Grand Total						**20**

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

First semester distribution of marks- CBCS scheme

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

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 separate physiology 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.

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 PROGRAMME 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	-	
	Compulsory foundation course	1. Basic Computer Application	03

SEMESTER-I
B.Sc. Allied Health Science Programmes (Medical Laboratory 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

Paper-II
Paper Title: (Gross Anatomy, Systemic Histology **)**
Credits (Theory 02, Practical 01)
Theory lectures: 30

Unit –1

Gastro- Intestinal System **05 hours**

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

Unit-2

Peritoneum 02 hours

Describe in brief Peritoneal folds

Unit-3

Respiratory System **03 hours**

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

Unit-4

Urinary System 03 hours

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

Unit –5

Reproductive System **04 hours**

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

Unit –6 04 hours

Endocrine glands

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

Unit –7

Neuroanatomy **04 hours**

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

Unit-8

Sensory Organs **05 hours**

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

PRACTICAL

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

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

Reference Books - Anatomy

1. William Davis (P) understanding Human anatomy and Physiology MC Graw Hill
2. Chaurasia –A text book of Anatomy T.S Ranganathan –A text book of human Anatomy .
3. Fattana, Human anatomy Description & applied) Saunder's & C P Prism publishers, Banglore
4. ESTER.M.Grishcimer, physiology & anatomy with practical Considerations J.P. Lippin cott. Philadelphia.
5. Bhatnagar Essentials of Human Embryology –Revised Edition Orient Blackswan Pvt.Ltd.
6. B.D.Chaurasia Human anatomy CBS publishers
7. Patrick W.Tank and Thomas R Gest Atlas of anatomy Lippincot williams and Wilkins
8. Hollinshed Text book of Anatomy Harper and Row Publishers
9. Willium J Larson Human embryology 3rd edition Churchill Living stone
10. Indebir Singh. Human neuro Anatomy Jaypee brothers
11. Halim A Surface and Radiological Anatomy CBS publishers

SEMESTER-I

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

Theory lectures: 30

Unit –1

Blood **10 hours**

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

Unit-2

Renal System **05 hours**

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

Unit-3

Digestive System **05 hours**

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

Unit-4

Cardiovascular System **05 hours**

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

Unit-5

Respiratory System **05 hours**

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

PRACTICAL

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

Hematology Experiments

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

Paper-II

Paper Title: (Physiology of hormonal and regulatory function)

Credits (Theory 02, Practical 01)

Theory lectures: 30

Unit –1

Muscle And Nerve Physiology **02 hours**

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

Unit-2

Endocrinology **09 hours**

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

Unit-3

Reproductive System **05 hours**

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

Unit-4

Central Nervous System **09 hours**

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

Unit-5

Special Senses **05 hours**

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

PRACTICAL

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

Clinical Physiology

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

Reference Books Physiology

1. Guyton (Arthur) Text Book of Physiology. Latest Ed. Prism publishers
2. Chatterjee(CC) Human Physiology Latest Ed. Vol-1, Medical Allied Agency
3. Choudhari (Sujith K) Concise Medical Physiology Latest Ed. New Central Book,
4. Ganong (William F) Review of Medical Physiology. Latest Ed . Appleton
5. Pal G.K. Text book of Medical physiology Avichal publishing company
6. Campbell FJM Clinical physiology ELBS
7. Schmidi R.F. and Thews G Human physiology Springer verlong
8. Parvathi Pal A text book of practical physiology

SEMESTER-II

Papers

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

Second semester distribution of hours and credit- CBCS scheme

Subject	Paper	Subjects	Theory		Demonstrations/ assignments		Tutorials		Total	
			hours	**Credits**	hours	**Credits**	hours	**Credits**	Hours	**Credits**
Core course (CC)	Paper-I B101	Elementary aspects of biochemistry	40	**02**	40	**01**	40	**02**	160	**05**
	Paper-II B102	Elementary microbiology.	40	**02**	40	**01**	40	**02**	160	**05**
	Paper-III B103	Basics of general ,systemic, clinical, hematology and histopathological technique	40	**02**	40	**01**	40	**02**	160	**05**
Compulsory foundation Course (FC)	B104	English for communication	30	**02**			-	-	30	**02**
Ability enhancement course (AEC)	B105	Environmental science	30	**02**	Field visit-	**01**	-	-	30	**03**
		Total	180	**09**	240	**07**	120	**03**	540	**20**
Discipline specific electives (DE)	B106 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)						
				Grand Total						**21**

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

Second semester distribution of marks- CBCS scheme

Subject	Paper/code	Subjects	Theory				Practical			
			Theory	Viva voce	I.A	Sub total	Practical	I.A	Sub total	Grand total
CC Bio chemistry	Paper-I B101	Elementary aspects of biochemistry	80	-	20	100	-	-	-	100
CC Micro biology	Paper-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
Compulsory foundation course (CF)	B104	English for communication	50	-	-	50		-	-	50
Ability enhancement course (AEC)	B105	Environmental science-	60-	--	20	80	--	-	-	80
Discipline specific electives (DE)	B106 Biochemistry B107	1. Basic aspects of research 2.Sample collection, preservation and transportation	30	-	-	30	-	-	-	30
	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)								
		Total	**380**		**80**	**460**	-	-	-	**460**

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

DETAILS OF THE COURSES

I. CORE COURSES- BIOCHEMISTRY

1. Elementary aspects of Biochemistry.

Discipline specific elective biochemistry

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

II CORE COURSES – MICROBIOLOGY

1. Elementary Microbiology.

Discipline specific elective Microbiology

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

Ability enhancement course

1. Environmental Science

Compulsory foundation course

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 PROGRAMME STRUCTURE

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

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

Subject: Biochemistry
Paper-I
Paper Title: (Elementary aspects of Biochemistry)

Credits (Theory 02, Demonstartion 01)

Theory lectures: 40

Unit –I **04hour**

Laboratory hazards and its prevention

Common laboratory accidents and ways for its prevention. First Aid in the Clinical laboratory, Laboratory precautions, storage and handling of dangerous chemicals, safety measures. Conventional and SI Units

Unit-2 **02 hours**

Definition of Atomic weight, Molecular weight and Equivalent weight of elements and compounds

Unit-3 **05 hours**

Normality, Molarity, Molality – definition and preparation of solutions with examples

Unit 4

Acids and Bases **06hour**

Definition. Properties, theories, Classification, examples of strong and weak acids.

Basic concepts of Acid base reaction, Ionization of water, pH- definition, Henderson's Hassel Bach's equation, its applications and measurement.

Unit-5 **02hour**

Indicators

Definition, concepts, mechanisms of an indicator, use and its limitations, Commonly used indicators and their pH range. Ideal pH indicators used in different titrations. Universal indicators

Unit-6: **04hour**

Buffers

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

Unit-7 **02hour**

Normal values and its interpretations

Unit 8 **06hour**

Biophysics

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

Unit-9 **05hour**

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

Unit 10 **04hours**

Quality control

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

Syllabus
Subject: Biochemistry
Paper-I
Paper Title: (1.Elementary aspects of biochemistry)

Demonstrations **(01 credit)**

Unit-1 **08 hours**

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

Cuvettes (Types, precautions, uses and limitations)

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

Unit-2 **12 hours**

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

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

Unit-3 **4 hour**

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

Unit –4 **4 hour**

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

Unit-5 **4 hour**

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

Unit-6 **02 hours**

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

Unit-7 **02 hours**

Normal values & interpretations –
(Normal reference range)

Reference Books Biochemistry

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

Subject: Microbiology
Paper Title: (Elementary Microbiology)

Credits (Theory 02, Demonstration 01)

Theory lectures: 40

Unit-1 **05 hour**

Bacterial cell*: Anatomy, labeled diagram,

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

Unit-2 **06 hour**

Sterilization & Disinfectants* :

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

Unit-3 **03 hour**

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

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

Unit-4 **02 hour**

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

Unit-5 **04 hour**

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

Unit-6 **02 hours**

Bacterial infections / diseases: *

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

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

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

Unit-7 **08 hours**

Viral infections / diseases:*

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

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

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

Unit-8 **02 hour**

Fungal infections / diseases :*

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

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

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

Unit-9 **04 hours**

Parasitic infections / diseases :*

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

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

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

Describe the preventive & control measures against the heliminths

Unit-10 **04 hours**

Bio safety

Describe the standard precautions to be followed in the work place

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

Note: * these chapters can be asked for long essay

Electives:

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

Reference Books Microbiology

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

SEMESTER-II

B.Sc. Allied Health Science Programmes Syllabus

Subject: Pathology

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

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

Unit-1
(Basics in General Pathology)

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

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

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

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

Unit-4
(Clinical Pathology)
Urine examinations
Collection and transport of various clinical specimens
Unit-5 (Techniques in pathology)
Basics in tissue processing, FNAC, staining techniques.

DEMONSTRATIONS
Hemoglobin estimation.

Erythrocytes sedimentation Rate (ESR)

Urine examination

H&E staining

Blood grouping

Rh typing

Reference Books Pathology

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

Semester-III

Papers

1. Ocular Anatomy & Ocular Physiology
2. Ocular Microbiology & Ocular Biochemistry
3. Physical & Physiological Optics
4. Skill Enhancement course (SAFE-i)

Third semester B.Sc. in Ophthalmic Technology distribution of hours and credit-

CBCS scheme

Subject	Paper	Subjects	Theory		Practical		Demonstrations/ assignments		Tutorials		Total	
			hours	**Credits**	hours	**Credits**	hours	**Credits**	hours	**Credits**	Hours	**Credits**
Core course (CC)	Paper-I C101	Ocular Anatomy & Ocular Physiology	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-II C102	Ocular Microbiology & Ocular Biochemistry	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-III C103	Physical & Physiological Optics	40	**02**	40	**01**	40	1	40	**02**	160	**06**
Skill enhancement course (SEC)	C104	*Safe - i*	30	**03**	-	**-**	-	-	-	**-**	30	**03**
		Total	150	**09**	120	**03**	120	03	120	**06**	510	**21**

B.Sc. in Ophthalmic 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	**Ocular Anatomy & Ocular Physiology**	**100**	**30**	**20**	**150**	**40**	**10**	**50**	**200**
		Section-A Ocular Anatomy	50	15	10	75	20	5	25	100
		Section-B Ocular Physiology	50	15	10	75	20	5	25	100
	Paper-II C102	**Ocular Microbiology & Ocular Biochemistry**	**100**	**30**	**20**	**150**	**40**	**10**	**50**	**200**
		Section-A Ocular Microbiology	50	15	10	75	20	5	25	100
		Section-B Ocular Biochemistry	50	15	10	75	20	5	25	100
	Paper-III C103	**Physical & Physiological Optics**	**100**	**30**	**20**	**150**	**40**	**10**	**50**	**200**
Skill enhancement course (SEC)	C104	*Safe - i*	50	-	-	50	-	-	-	50
		Total	**350**	**90**	**60**	**500**	**120**	**30**	**150**	**650**

THIRD SEMESTER PROGRAMME STRUCTURE

Semester	Course Opted	Course Name	Credits
Third Semester	**Core courses-**	**Ocular Anatomy & Ocular Physiology**	06
		Ocular Microbiology & Ocular Biochemistry	06
		Physical & Physiological Optics	06
	Skill Enhancement course	SAFE i	03

SEMESTER-III
B.Sc. in Ophthalmic Technology programme Syllabus
Paper 1 Subject: Ocular anatomy and Physiology
(Section-A and Section B)
Credits (Theory 02, Practical 02, Demonstrations 1)

Total Theory 40 hours

Ocular Anatomy **Theory 20 hours**

Introduction of human body, cell and various tissue of the body,Embryology and development, Embryology of the eye in general, Orbit and its immediate relations , Lids and eye lid glands, Conjunctiva. Cornea and Sclera , Iris and Ciliary body , Lens and Vitreous , Retina & Choroid , Ocular Muscles , Visual pathways , Sympathetic and parasympathetic system , Vascular supply of eye, Lacrimal apparatus, Higher visual centres.

Practical:

Ocular anatomy **20 Hours**

1. Introduction of human body, cell and various tissue of the body
2. Embryology and development of eye
3. Section of Eye ball
4. Sections of Brain

Section B - Ocular Physiology **Theory 20 Hours**

Central Nervous System , Brain & Cranial Nerves ,Autonomic nervous system ,

The Food, Vitamins & Protein,

General physiology of the eye - An introduction , Protective mechanism in the eye. Eye lid lacrimation descriptive of the globe, Maintenance of Transparency of the Cornea , Maintenance of Transparency of the Lens , Retina structure and functions, Visual acuity and form sense, The visual stimulus refractive errors, Pupillary reflexes, Crystalline lens and Accommodation, Convergence,Intra Ocular Pressure, Vision –general aspects of sensation. Night Vision ,Colour Vision and colour vision defects, Visual Fields, visual pathways central and cerebral connections, lesions of pathways and effects, Extrinsic Muscles, Actions and Ocular Movements, Higher Visual Centres and righting reflexes, Visual perception binocular vision stereoscopic vision optical illusion,.Electrophysiological Aspects, Conjugate and Disguate - Movements of the eye

Practical:

Ocular physiology **20 Hours**

1. Visual pathways
2. Extra ocular muscles
3. Binocular vision
4. Retinal correspondence (Normal and abnormal)

SEMESTER-III
B.Sc. in Ophthalmic Technology programme Syllabus
Paper II Subject: Ocular Microbiology and Biochemistry
(Section-A and Section B)
Credits (Theory 02, Practical 02, Demonstrations 1)

Total Theory 40 hours

20 hours

Section A: Ocular Microbiology **Theory 20 Hours**

Introduction to Microbiology

classification,

Gram Positive Bacteria,

Gram Negative Bacteria ,

Fungi -saprophytic and pathogenic ,

Virus, Aseptic techniques ,

Chlamedia& parasites

Practical:

Ocular Microbiology **20 Hours**

1. Introduction to Microbiology: Culture media, Classification, Morphological, Lab. diagnosis of infection
2. Collection of samples
3. Serology
4. Culture media for bacteria, fungi and viruses
5. Oxidase test
6. Mantoux test
7. Staining procedures: Gram Staining
8. Staining procedures: Romanowsky stains
9 Staining procedures: ZiehlNeelsen's staining

Section B: Ocular Biochemistry **theory 20hours**

Biochemistry of anterior segment of eye

Unit-1

Fundamentals of Biological macromolecules glycosaminoglycan, proteins (collagen – plasma proteins – Muscle proteins)

Unit-2

Ophthalmologic ally important vitamins A, B, C, E and inositol & regularly mechanisms. Importance of ocular biochemistry in clinical optometric practice

Unit-3

Tear film – composition – lipid layer – aqueous layer – mucoid layer- functions-dysfunction- diagnostic tests –tear substitutes- recent development.

Unit-4

Cornea – biochemical composition of epithelium – bowman's layer – stroma – descendants layer – endothelium – functions – corneal metabolism– nutrient uptake energy – transparency – barrier mechanism –pump action – irrigating solutions – aging and other anomalies – recent developments.

Unit- 5

Lens – composition – metabolism – glucose utilization – sorbitol pathways – glutathione and ascorbic acid transport – transparency – cataract formation - aging photo oxidation – sugar cataract – cataract and ascorbic acid act medical therapy – recent developments.

Unit- 6

Aqueous humour –composition – function –ciliary body – aqueous humour production – IOP- Glaucoma

Biochemistry of Posterior segment of eye **10hours**

Unit-1

Vitreous humour –structure – composition functions – vitreous biochemical pathology – intraocular gels – recent developments

Unit-2

Retina – Pigment epithelium – structure – composition – photoreceptor cells – rhodopsin – lipids renewal – inner segment Pigment epithelium – choroid – metabolism and function – phagocytosis –

Vitamin A-retinal function and metabolism. Retinal neurochemistry Monoamines – acetyl choline – GABA – amino acids – taurine – neuropeptides Biochemical correlates of retinal diseases.

Practical:

Ocular Bio-Chemistry **20hours**

1 Sampling and Collection of Blood.

2.Biochemical tests for carbohydrates, proteins and lipids

3 Analysis of normal and abnormal constituents of urine

4.Spectrophotometry

5.Estimation of blood sugar

6.Ketone bodies in urine

7.Estimation of Serum-cholesterol

SEMESTER-III
B.Sc. in Ophthalmic Technology programme Syllabus
Paper III Subject: Physical and Physiological Optics
Credits (Theory 02, Practical 02, Demonstrations 1)

Physical and Physiological Optics **Theory 40 hours**

Unit-1

Elementary basis of light- Interference, diffraction, polarization spectrum, surface tension, viscosity , Principles of Refraction,

Unit-2

Physical Optics

1, Lens Shapes -Convex, Concave ,

2, Thin Lens equation, thick lens equation ,

3, Front and back vertex power ,

4. Aberrations,

5. Spherical, Cylindrical &Toric surfaces, Aspheric surfaces, Prisms -definition, uses, nomenclature, apex ,

Determination of focal length &diopteric power of lens ,Strum's Conoid, Neutralization of lenses ,Schematic eye ,Emmetropia &Ammetropia -Aetiology, Population, Distribution,Growth of eye, Myopia, Hypermetropia, Astigmatism, Aphakia/Pseudo-phakia, Presbyopia, Keratoconus, Post-Operative. Refractive errors, Refraction of irregular reflex,

Accommodation & Convergence-1, Far point, near point, range, amplitude of accommodation ,

Accommodation& Convergence -2. Methods of measurements, AC/A ratio

Retinoscopy -Principle & Methods , Objective Refraction, Subjective Refraction

Practical

Orthoptics **20hours**

1. Latent squint work-up
2. Synptophore
3. Maddox wing
4. Maddox rods
5. Prism bar
6. Near point of accommodation
7. Near point of convergence
8. Fusion exercises

Practical

Optics **20hours**

1. Workshop
2. Spectacle Lens
3. Bifocal Lenses
4. Measurement for ordering spectacle, IPD, Marking centration, V. D. Calculation
5. Refraction under the supervision

SEMESTER-IV

Papers

1. Ocular Pathology, Ocular Pharmacy and Pharmacology
2. Refraction Investigative Ophthalmology
3. Ophthalmic instruments and appliances
4. Ability enhancement Compulsory Course **(**AECC)
   Constitution of India

Fourth semester B.Sc. in Ophthalmic Technology distribution of hours and credit-

CBCS scheme

Subject	Paper	Subjects	Theory		Practical		Demonstrations/ assignments		Tutorials		Total	
			hours	**Credits**	hours	**Credits**	hours	**Credits**	hours	**Credits**	Hours	**Credits**
Core course (CC)	Paper-I D101	Ocular Pathology Ocular Pharmacy and Pharmacology	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-II D102	Refraction Investigative Ophthalmology	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-III D103	Ophthalmic instruments and appliances	40	**02**	40	**01**	40	1	40	**02**	160	**06**
AECC	D104	Constitution of India	30	**02**							30	**02**
		Total	150	**08**	120	**03**	120	03	120	**06**	510	**20**

Fourth semester B.Sc. in Ophthalmic Technology 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	**Ocular Pathology, Ocular Pharmacy and Pharmacology**	**80**	**30**	**30**	**140**	**40**	**20**	**60**	**200**
		Section-A Clinical Pathology	40	15	15	70	20	10	30	100
		Section-B Ocular Pharmacy and Pharmacology	40	15	15	70	20	10	30	100
	Paper-II D102	**Refraction Investigative Ophthalmology**	100	30	20	150	40	10	50	200
	Paper-III D103	**Ophthalmic instruments and appliances**	100	30	20	150	40	10	50	200
AECC	D104	Constitution of India	50	-	-	50	-	-	-	50
		Total	**330**	**90**	**70**	**490**	**120**	**40**	**160**	**650**

FOURTH SEMESTER PROGRAMME STRUCTURE

Semester	Course Opted	Course Name	Credits
Fourth Semester	**Core courses- Microbiology**	**1. Ocular Pathology Ocular Pharmacy and Pharmacology**	06
		2. **Refraction Investigative Ophthalmology**	06
		3. **Ophthalmic instruments and appliances**	06
	AECC	Constitution of India	02

SEMESTER-IV
B.Sc. in Ophthalmic Technology program Syllabus
Paper I Subject: Ocular Pathology Ocular Pharmacy and Pharmacology
(Section A Ocular Pathology, Section B Ocular Pharmacy and Pharmacology)
Credits (Theory 02, Practical 02, Demonstrations 1)

Ocular Pathology, Ocular Pharmacy and Pharmacology **Theory 40 hours**

Section A : Ocular Pathology

Unit 1

General Introduction

1. Inflammation and repair
2. Ophthalmic wound healing
3. Infections (tuberculosis, leprosy, syphilis, fungus, virus, Chlamydia)
4. Intraocular tumors (retinoblastoma, choroidal melanoma)
5. Optic nerve (normal and tumors)
6. Hematology (anemia, Leukemia and bleeding disorders) clinical pathology examination of urine-(collection methods, Physical Examination, Chemical Examination and Microscopic Examination) and blood smears.
7. Eyelid (normal and pathology including inflammations and tumors)
8. Cornea (normal and pathology in degeneration and dystrophies)
9. Lens (normal and pathology of cataract)
10. Retina (normal and pathology in inflammatory disease, infections)
11. orbit (inflammation and neoplasia)

PRACTICAL

1. Urine collection methods
2. Physical Examination of Urine
3. Chemical Examination of Urine
4. Microscopic Examination of Urine

COURSE CONTENTS FOR BSc Ophthalmic Technology
Second Year IV semester
Section B - Ocular Pharmacy and Pharmacology
BATCH 2016 -2017 onwards CBCS

Pharmacology Theory topics and hours

Topics	Must know	Desirable to know	Nice to know	Hours 20	Marks 40
Unit 1: Ocular Pharmacology	√			**3**	**15**
Introduction	√				
Routes of drug administration	√			**3**	
Unit 2: Autonomic nervous system					
Miotics, Mydriatics and Cycloplegic drugs					
Drugs used in glaucoma	√			**2**	
Unit 3: Local anaesthetics	√			**2**	
Unit 4: Anti-inflammatory drugs and analgesics					
Non steroidal anti-inflammatory drugs					
Corticosteroids					
Opioids (Tramadol, Morphine, Fentanyl)					
Unit 5: Antimicrobials				**4**	**15**
Drugs used in bacterial infections	√				
Drugs used in viral and fungal infections		√			
Unit 6: Preparations used in eye	√			**4**	**07**
Dyes, Preservatives, Lubricants					
Irrigating solutions, Contact lens solution					
Antiseptics and disinfectants					
Unit 7: Immunosuppressive agents			√	**1**	**03**
Unit 8: Chelating agents		√		**1**	

Tutorials: 20 hours

COURSE CONTENTS FOR BSc Ophthalmic Technology
Second Year IV semester
Section B - Ocular Pharmacy and Pharmacology
BATCH 2016 -2017 onwards CBCS

Pharmacology Practical topics and hours

Topics	Must know	Desirable to know	Hours 20	Marks 20
Unit 1: Experimental Pharmacology				
1.Demonstrating effect of drugs on eye using charts	√		**06**	**06**
a) Pilocarpine	√			
b) Homatropine	√			
c) Phenylephrine	√			
d) Lignocaine	√			
2. Chemical tests			**04**	**07**
a) Test for Iodides	√			
b) Steroid detection test	√			
c) Test for gentamicin	√			
d) Test for paracetamol	√			
Unit 2: Clinical Pharmacology				
1. Dosage forms – Eye drops			**10**	**07**
a) Methylcellulose	√			
b) Glycerin	√			
c) Dexamethasone	√			
d) Ciprofloxacin	√			
e) Chloramphenicol applicaps	√			
f) Timolol	√			
g) Diclofenace	√			
h) Latanoprost	√			
i) Olapatadine	√			
j) Flurbiprofen	√			

Table of specification FOR BSc Ophthalmic Technology

Second Year IV semester
BATCH 2016 -2017 onwards CBCS
Section B - Ocular Pharmacy and Pharmacology

Chapter wise distribution of types of Questions and Marks will be as under

The pattern of questions would be of three types

Chapter/Topic	**Type and No. of Questions**	**Marks 40**
Routes of drug administration, Drugs used in glaucoma , Local anesthetics, Anti-inflammatory drugs and analgesics - Non steroidal anti-inflammatory drugs Corticosteroids, Opioids (Tramadol, Morphine, Fentanyl), Drugs used in bacterial infections	Long Essay 1X10	10
Routes of drug administration, Miotics, Mydriatics, and cycloplegic drugs, Drugs used in glaucoma, Local anaesthetics, Anti-inflammatory drugs and analgesics - Non steroidal anti-inflammatory drugs Corticosteroids, Opioids (Tramadol, Morphine, Fentanyl), Drugs used in bacterial infections, Ocular lubricants	Short Essay 3X5 (Answer any 3)	15
Drugs used in viral infections, fungal infections, Ophthalmic dyes, preservatives, Ocular lubricants and irrigating solutions, Ocular antiseptics and disinfectants, Contact lens solutions	Short Answer 5X3 (Answer any 5)	15

Scheme of Examination for BSc Ophthalmic Technology
Second Year IV semester
BATCH 2016 -2017 onwards CBCS
Section B - Ocular Pharmacy and Pharmacology

Internal assessment

Theory: 15 Marks

Practical: 10 Marks

University examination

Theory: The pattern of question paper is as follows for 40 marks paper

Type of questions	Number of questions	Marks for each questions	Total
Long Essay	1 (No choice)	10	10
Short Essay	4 (Answer any three)	05	15
Short Answer Questions	6 (Answer any five)	03	15
Total Marks			40

Practical:

Distribution of marks for practical examination – 20

Topic	Marks
Experimental Pharmacology	13
Clinical Pharmacology	07
Total marks	20

Viva Voce Examination – 15 marks

Topic	Marks
Routes of drug administration, Drugs used in glaucoma, Local anesthetics, Anti-inflammatory drugs and analgesics and Drugs used in bacterial infections	08
Miotics, Mydriatics, and cycloplegic drugs, Drugs used in viral infections, fungal infections, Ophthalmic dyes and preservatives, Ocular lubricants and irrigating solutions, Ocular antiseptics and disinfectants, Contact lens solutions	07
Total marks	15

Examination components and distribution of marks for
BSc Ophthalmic Technology Second Year IV semester
BATCH 2016 -2017 onwards CBCS
Section B - Ocular Pharmacy and Pharmacology

A	**THEORY**	
1.	Written paper No. of papers Maximum marks	 One 40
2.	Viva-Voce	15
3.	Internal Assessment (Theory)	15
	Total Theory	**70**
B	**PRACTICAL**	
1.	Practical	20
2.	Internal Assessment (Practical)	10
	Total Practicals	**30**
	Grand Total	**100**

RECOMMENDED TEXTBOOKS

1. Gupta SK, Agarwal R, Srivastava S. Clinical Ocular Pharmacology and Therapeutics, 1st edition, Jaypee Brothers, New Delhi 2014
2. K.D. Tripathi. Essentials of Medical Pharmacology,7th edition, Jaypee Brothers, New Delhi 2013
3. RS Satoskar, Nirmala Rege, SD Bhandarkar. Pharmacology and Pharmacotherapeutics. 24th edition, Elsevier India Gurgaon 2015

SEMESTER-IV
B.Sc. in Ophthalmic Technology programme Syllabus
Paper II Subject: Refraction Investigative Ophthalmology
Credits (Theory 02, Practical 02, Demonstrations 1)

Refraction and Investigative ophthalmology **Theory 40 hours**

Unit1: Refraction

1. Emmetropia&Ammetropia -Aetiology, Population, Distribution, Growth of eye
2. Myopia
3. Hypermetropia
4. Astigmatism
5. Aphakia/Pseudo-phakia
6. Presbiopia
7. Keratoconus
8. Post-Op. Refractive errors
9. Refraction of irregular reflex
10. Accommodation & Convergence –1. Far point, near point, ranges. Amplitude of accommodation
11. Accommodation & Convergence – 2. Methods of measurements, NPA. AC/A ratio
12. Retinoscopy -Principle & Method
13. Objective Refraction
14. Subjective Refraction, Cross Cylinder

Unit2 : Investigative Ophthalmology

1. Orthoptics-General Concept
2. Ocular muscles and movements
3. AC/ A ratio
4. Measurements of angle of squint
5. Latent squint
6. Maddox rod
7. Maddox wing
8. Manifest concomitant
9. Squint concomitant
10. Paralytic Squint
11. Head posture and its significance
12. Hess Screening and its Interpretations
13. Occlusion -types and uses
14. Nystagmus
15. Testing of ARC
16. Amblyopia
17. Disorders of accommodation
18. Paediatric visual acuity assessment
19. Paediatric Refraction
20. Neural aspects of binocular vision

SEMESTER-IV
B.Sc. in Ophthalmic Technology programme Syllabus
Paper III Subject: Ophthalmic Instruments and Appliances

Credits (Theory 02, Practical 02, Demonstrations 1)

Ophthalmic Instruments and Appliances **Theory 40 hours**

1. Indirect Ophthalmoscope
2. Direct Ophthalmoscope
3. Slit Lamp: Haag-Streit
4. Photo-slit lamp
5. Lensometer. Lens gauge
6. Tonometer
7. Fundus Camera
8. External eye photography
9. Auto-refractometer
10. Corneal Examination -1. Placido disc
11. Corneal Examination -2. Keterometer
12. Exophthalmometer
13. Perimeter – Manual & automated
14. Colour vision tests

Practical **20hours**

1. **Refraction**
   Refraction and prescription of glasses in OPD
2. **Investigative Ophthalmology**
   a. Manifest squint work-up
   b. Paralytic squint work-up
   c. Orthoptic Exercises
3. **Ophthalmic Instruments and Appliances**
   a. Lensometer, Lens gauge
   b. Tonometer
   c. Placido disc
   d. Keterometer
   e. Exophthalmometer
   f. Perimeter
   g. Slit Lamp: Haag-Streit.
   h. Photo-slit lamp
   i. Fundus Camera
   j. Contrast sensitivity tests
   K . Colour vision tests

SEMESTER-V

Papers

1. Clinical and Advanced orthoptics

2. Clinical and advanced optics

3. Contact lens and eye bank

4. Skill Enhancement course

Medical Ethics

B.Sc. in Ophthalmic 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	Clinical and Advanced orthoptics	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-II E102	Clinical and advanced optics	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-III E103	Contact lens and eye bank	40	**02**	40	**01**	40	1	40	**02**	160	**06**
Skill enhancement course (SEC)	E104	Medical Ethics	30	**02**	-	**-**	-	-	-	**-**	30	**02**
		Total	150	**08**	120	**03**	120	03	120	**06**	510	**20**

B.Sc. in Ophthalmic 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 E101	Clinical and Advanced orthoptics	80	-	20	100	-	-	-	100
	Paper-II E102	Clinical and advanced optics	80	-	20	100	-	-	-	100
	Paper-III E103	Contact lens and eye bank	80	-	20	100	-	-	-	100
	E105	Common Practical	-	30	-	30	60	10	70	100
Skill enhancement course (SEC)	E104	Medical Ethics	50	-	-	50	-	-	-	50
		Total	**290**	**30**	**60**	**380**	**60**	**10**	**70**	**450**

FIFTH SEMESTER PROGRAMME STRUCTURE

Semester	Course Opted	Course Name	Credits
Fifth Semester	**Core courses-**	Clinical and Advanced orthoptics	06
		Clinical and advanced optics	06
		Contact lens and eye bank	06
	Skill enhancement course (SEC)	Medical Ethics	02

SEMESTER-V
B.Sc. in Ophthalmic Technology programme Syllabus
Paper I Subject: Clinical and advanced orthoptics

Credits (Theory 02, Practical 02, Demonstrations 1)

Clinical and advanced orthoptics **Theory 40 hours**

Clinical & Advanced Orthoptics

1. Orthoptic-General concept
2. Ocular muscles and movements
3. AC/ A ratio
4. Measurements of angle of squint
5. Latent squint
6. Maddox rod
7. Maddox wing
8. Synoptophore
9. Manifest concomitant
10. Squint concomitant
11. Paralytic Squint
12. Head posture and its significance
13. Hess Screening and its Interpretations
14. Pleoptics
15. Occlusion -types and uses
16. Nystagmus
17. A. V. Syndromes
18. Testing of ARC
19. Amblyopia
20. Disorders of accommodation
21. Paediatric visual acuity assessment
22. Paediatric Refraction
23. Neural aspects of binocular vision

SEMESTER-V
B.Sc. in Ophthalmic Technology programme Syllabus
Paper II Subject: Clinical & Advanced Optics

Credits (Theory 02, Practical 02, Demonstrations 1)

Clinical & Advanced Optics **Theory 40 hours**

1. Emmetropia&Ammetropia –Aetiology, Population. Distribution, Growth of eye
2. Myopia
3. Hypermetropia
4. Astigmatism
5. Aphakia/Pseudo-phakia
6. Presbiopia
7. Keratoconus
8. Post-Op. Refractive errors
9. Refraction of irregular re/ex
10. Accommodation & Convergence -1. Far point, near point, range, amplitude of accommodation
11. Accommodation & Convergence -2. Methods of measurements. NPA. AC I A ratio.
12. Retinoscopy -Principle & Methods
13. Objective Refraction
14. Subjective Refraction
15. Cross Cylinder

SEMESTER-V
B.Sc. in Ophthalmic Technology programme Syllabus
Paper III Subject: Contact lens and eye bank

Credits (Theory 02, Practical 02, Demonstrations 1)

Contact lens and eye bank — Theory 40 hours

Contact Lens

1. History of Contact Lens
2. Corneal Anatomy and Physiology
3. Corneal Physiology and Contact Lens
4. Preliminary Measurements and Investigations
5. Slit Lamp Biomicroscopy
6. Contact Lens materials
7. Optics of the Contact Lens
8. Glossary of Terms: Contact Lenses
9. Indications and Contra Indications Contact Lens
10. Rigid gas permeable contact lens design
11. Soft Contact lens design & manufacture
12. Kertometery, Placido's disc, Tonography
13. Fitting philosophies
14. Fitting of Spherical SCL and effect of parameter changes
15. Astigmatism correction options
16. Fitting Spherical RGP contact Lenses, Low OK, High OK
17. Effects of RGP contact Lens parameter changes on lens fitting
18. Fitting in Astigmatism (Sph RGP)
19. Follow-up post fitting examination
20. Follow-up Slit Lamp examination
21. Fitting in Keratoconus
22. Fitting in Aphakia, Pseudophakia
23. Cosmetic Contact Lenses
24. Fitting Contact Lens in children
25. Toric Contact Lenses
26. Bifocal Contact Lenses
27. Continuous wear and extended wear lenses
28. Therapeutic Lenses/Bandage lenses
29. Contact lens following ocular surgeries
30. Disposable contact lenses, frequent replacement and Lenses
31. Care & maintenance of Contact Lenses
32. Contact Lens modification of finished lenses
33. Instrumentation in contact lens practice
34. Checking finished lenses parameters
35. Recent developments in Contact lenses
36. Review of lenses available in India

Eye Bank

1. Publicity
2. How to donate your eyes
3. Collection of eyes
4. Preservation of eyes
5. Pre-operative Instructions
6. Post-operative Instructions
7. Latest techniques for preservation of donor Cornea

Common practical semester- V

Clinical & Advanced Orthoptics

1. Manifest squint work-up
2. Paralytic squint work-up
3. Pleoptics
4. Orthoptic Exercises

Clinical & Advanced Optics

Refraction and prescription of glasses in independent cabin

Contact Lens

1. Contact Lens fitting
2. Counselling to Contact Lens patient
3. Post-fitting instructions
4. Remedy of post-fitting problems

Clinical & Advanced Refractions

Refraction and prescription of glasses

Eye Bank

1. How to donate your eyes/Counseling
2. Collection of eyes
3. Preservation of eyes

Note: Department can propose any additional practical if required

SEMESTER-VI

Papers

1. Community Ophthalmology
2. Investigations in Clinical Ophthalmology
3. Management of OT
4. Ability enhancement Compulsory course (AEC)
   Quality control

B.Sc. in Ophthalmic Technology Sixth 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 F101	Community Ophthalmology	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-II F102	Investigations in Clinical Ophthalmology	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-III F103	Management of OT	40	**02**	40	**01**	40	1	40	**02**	160	**06**
Ability enhancement compulsory course	F104	Quality control	30	**02**	-	**-**	-	**-**	-	**-**	30	**02**
		Total	150	**08**	120	**03**	120	03	120	**06**	510	**20**

B.Sc. in Ophthalmic 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	Community Ophthalmology	80	-	20	100	-	-	-	100
	Paper-II F102	Investigations in Clinical Ophthalmology	80	-	20	100	-	-	-	100
	Paper-III F103	Management of OT	80	-	20	100	-	-	-	100
	F105	Common Practical	-	30	-	30	60	10	70	100
Ability enhancement compulsory course	F104	Quality control	50	-	-	50	-	-	-	50
		Total	**290**	**30**	**60**	**380**	**60**	**10**	**70**	**450**

SIXTH SEMESTER PROGRAMME STRUCTURE

Semester	Course Opted	Course Name	Credits
Sixth Semester	**Core courses-**	Community Ophthalmology	06
		Investigations in Clinical Ophthalmology	06
		Management of OT	06
	Ability enhancement compulsory course (AECC)	Quality control	02

SEMESTER-VI
B.Sc. in Ophthalmic Technology programme Syllabus
Paper I Subject: Community Ophthalmology

Credits (Theory 02, Practical 02, Demonstrations 1)

Community Ophthalmology **Theory 40 hours**

1. Concepts of community Ophthalmology - I
2. Concepts of community Ophthalmology - II
3. The Epidemiology of Blindness (General Principles) - I
4. The Epidemiology of Blindness (General Principles) - II
5. The Epidemiology of Blindness (Disease specific strategies) - III
6. The Epidemiology of Blindness (Disease specific strategies) - IV
7. Survey Methodological - I
8. Survey Methodological - II
9. Survey Methodological - III
10. Screening procedures in Ophthalmology – I
11. Screening procedures in Ophthalmology – II
12. School eye screening programme
13. Primary eye care
14. Organization of Outreach services
15. Organization of Reach-in-Programme
16. Information, Education, communication
17. Rehabilitation of the visually handicapped
18. National programme for control of Blindness – I
19. National programme for control of Blindness – II
20. Vision 2020 : The Right to sight

SEMESTER-VI
B.Sc. in Ophthalmic Technology programme Syllabus
Paper II Subject: Investigations in Clinical Ophthalmology

Credits (Theory 02, Practical 02, Demonstrations 1)

Investigations in Clinical Ophthalmology **Theory 40 hours**

1. Principle, Techniques and preparation of the patient
2. Ultra-sono-graphy
3. Fluorescein Angiography
4. Ocular Photography -anterior segment
5. Dark Adaptometry : Adaptation &Adaptometry
6. Syringing & Lacrimal function Test
7. Gonioscopy
8. Perimetry
9. Laser therapy
10. Contrast Sensitivity
11. Slit Lamp
12. Fundus Photography
13. Colour Vision Investigations – Ishhara Charts, E-G Lantern, Negal'sanomaloscope, 100 Hue Test
14. A -Scan Biometry

SEMESTER-VI
B.Sc. in Ophthalmic Technology programme Syllabus
Paper III Subject: Management of OT

Credits (Theory 02, Practical 02, Demonstrations 1)

Management of OT **Theory 40 hours**

1. Introduction to Ocular in general
2. Asepsis: How to achieve
3. Anesthetic agents and where indicated
4. 0 T Sterilization procedures
5. Sterilization procedures of 0 T Instruments
6. Maintenance of Instruments and equipments: Ophthalmic Instruments
7. Maintenance of Instruments and equipments: Surgical Instruments
8. Maintenance of Instruments and equipments: Optometric & Contact Lens Equipment

Clinical Ophthalmology

Anterior Segment Disease

1. Definition and types of anterior blepharitis.
2. Define and classify conjunctivitis.
3. Describe the clinical features of chalazion and its complications.
4. Describe the clinical features of Hardeolum and its complications.
5. Define and classify infective keratitis.
6. Define pterygium and enumerate the differences between pterygium and pseudo pterygium.
7. Preoperative evaluation of cataract surgery.
8. Define glaucoma and describe the symptoms
9. What is iridocyclitis and mention the symptoms of acute iridocyclitis.
10. Corneal ectasia and its types.
11. Desmetocele

Posterior Segment Disease

1. Causes for soft and hard exudates.
2. What is choroidal detachment and describe the symptoms.
3. Macular function tests.
4. What is Retinoblastoma and its mode of inheritance
5. What are the causes of Leucocoria?
6. What are the causes of night blin-dness?
7. Define papilledema and describe its symptoms.
8. Optic nerve function tests
9. What is Retinal Detachment? What are the types of RD? Describe the Symptoms.

Common practical semester- VI

Community Ophthalmology

1. Eye Screening Programme & Surveys
2. Eye camp (approx. 3) of 10 days each
3. PHC posting

Investigations in Clinical Ophthalmology

1. Fluorescein Angiography
2. Syringing & Lacrimal function Test
3. Slit Lamp
4. Applanation and schiotz tonometry
5. Dark Adaptometry
6. A -Scan Biometry
7. Contrast Sensitivity
8. Perimetry
9. Keratometry

Books Recommended

1. Text book of Ophthalmology - By Khurana
2. Manual of Diseases of Eye - By May and Worth
3. Optics and refraction - By Khurana
4. Atlas of primary eye care Procedures - By Linda Casser

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

THEORY

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

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

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

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

-End-

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,
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REGULATIONS GOVERNING

THE BACHELOR OF SCIENCE (B.Sc.)

DEGREE

UNDER CHOICE BASED CREDIT SYSTEM

2016

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

CHOICE BASED CREDIT SYSTEM IN ALLIED HEALTH SCIENCES

INTRODUCTION

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

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

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

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

DEFINITIONS OF KEY WORDS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

B.Sc. PROGRAMS STRUCTURE

Semester	Program structure
I	Basic medical sciences Common to all disciplines as mandatory core courses (CC), 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

2. DURATIONS

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

3. CALENDAR OF EVENTS

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

4 ELIGIBILITY FOR ADMISSION

A Candidate seeking admission to B.Sc. program

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

OR

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

OR

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

OR

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

OR

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

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

5 LATERAL ENTRY

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

6 ATTENDANCES

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

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

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

7. MAXIMUM PERIOD FOR COMPLETION OF THE PROGRAMS

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

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

9. TEMPORARY DISCONTINUATION OF THE PROGRAM

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

10. HOURS OF INSTRUCTION PER WEEK

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

11. COURSE PATTERN

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

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

12. THE SCHEME OF EXAMINATION

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

13. INTERNAL ASSESSMENT

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

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

14. REGISTERING FOR THE EXAMINATIONS

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

15. VALUATION OF ANSWERSCRIPTS

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

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

16. RESULTS CLASSIFICATION OF SUCCESSFUL CANDIDATES

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

Table 1: Final Result/Grades Description

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

Table 2 point grading system with letter grade

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

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

17.1 Calculation of SGPA

The following procedure to compute the Semester Grade Point Average

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

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

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

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

Example for SGPA (20 Credits)

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

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

Classification of Result **:** First Class

Illustration for SGPA

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

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

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

Semester Alpha Sign Grade: **B**

17.2 Calculation of CGPA

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

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

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

Example for CGPA

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

ILLUSTRATION I

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

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

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

Illustration for CGPA

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

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

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

CGPA 7.56 A (very good) First class with distinction

18. TRANSCRIPT (SCORE CARD /MARKS SHEET) FORMAT

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

19. MINIMUM FOR A PASS

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

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

20. GRACE MARKS

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

21. CARRY OVER PROVISION

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

22. REVALUATION

There is no revaluation permissible in the regulation

23. POWER TO REMOVE DIFFICULTIES:

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

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

a)

PREVIEW ONLY, NOT FOR PRINTING

GRADE CARD

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

Register Number : 17IMT001

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

Sl. No.	Subject / Paper		Theory / Practical		I.A. / Viva		Total		Cr. Hrs.	Gr. Pts.	Cr. Pts.	Remarks
			Max.	Sec.	Max.	Sec.	Max.	Sec.				
	Core Course											
01	**Anatomy-I :** General Anatomy, Histology and Embryology	Th. 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	

SDUAHER

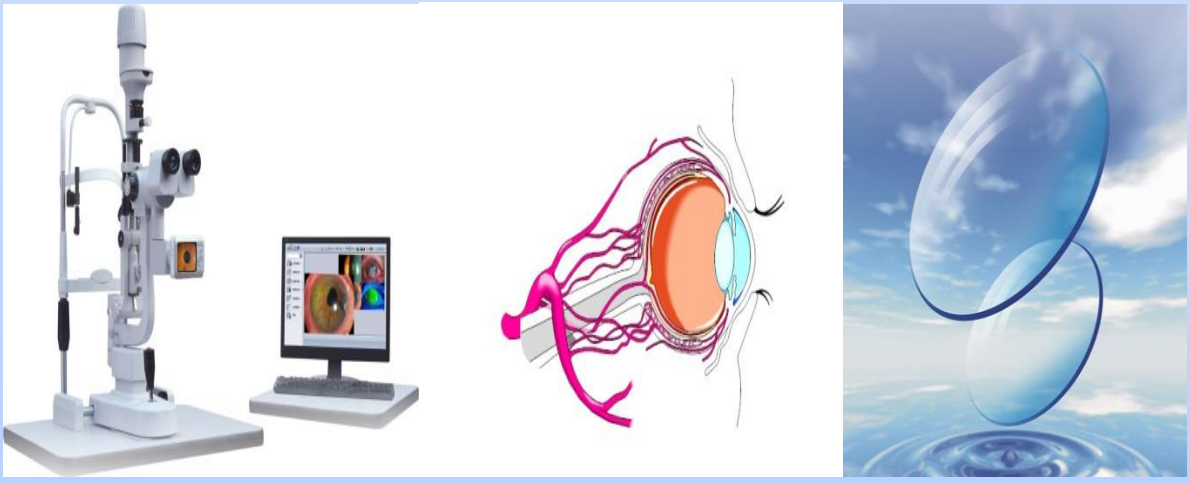
SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH

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

BACHELOR OF SCIENCE (B.Sc.)

In Ophthalmic Technology & Optometry

2017



SYLLABUS UNDER

CHOICE BASED CREDIT SYSTEM

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH

KOLAR. KARNATAKA

SDUAHER

Bachelor of Science (B.Sc.) in Ophthalmic Technology & Optometry

(CBCS scheme)

UNDER FACULTY OF ALLIED HEALTH SCIENCES

As per University Grants Commission

2017-18

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 POSTERITY**"

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 programmes 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 programmes 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 Medical laboratory 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 & RESEARCH
Comprising Sri Devaraj Urs Medical College
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No: SDUAHER/KLR/ADMN/ 2355 / 2018-19 Date: 07.11.2018

NOTIFICATION

Sub: Implementation of revised B.Sc. Ophthalmic Technology and Optometry, and B.Sc. Anesthesia and Operation Theater technology Faculty of Allied Health and Basic Science.

Ref: 1. Proceedings of the 19th meeting of Board of studies UG/PG in Allied Health Sciences held on 09.02.2018
2. Proceedings of the 30th Academic Council meeting held on 05.05.2018
3. Proceedings of the 48th meeting of Board of Management held on 20.06.2018

Sri Devaraj Urs Academy of Higher Education and Research through the Department of Allied health sciences is offering Under Graduate programme -B.Sc. Ophthalmic technology, and B.Sc. Operation Theater technology. The related prevailing syllabus revised based on the decision passed in the Academic council by incorporating few distinct papers of optometry to the suitability of the title B.Sc. Ophthalmic Technology and Optometry shall be applicable to 2017-18 batch students.

Similarly, few distinct papers of Anesthesia technology incorporated in to B.Sc. Operation Theater technology to the suitability of the title B.Sc. Anesthesia and Operation Theater technology shall be applicable to 2018-19 batch students.

By Order,

Sd/-
Registrar

Structure of B.Sc. Ophthalmic Technology & Optometry Programme under CBCS scheme

Semester	Core courses (1-21)	Discipline specific elective (DSE)	Ability enhancement Compulsory Course (AEC)	Skill enhancement courses (SEC)	Open elective (OE)	Foundation course
I	1&2.Anatomy –I & II 3&4.Physiology – I & II	DSE-1 DSE-2 DSE-3 DSE-4	-	-	-	Basic Computer Application
II	5.Biochemistry 6.Microbiology 7.Pathology	DSE-1 DSE-2 DSE-3 DSE-4 DSE-5 DSE-6	Environmental science	-	-	English communication
III	8 Ocular Anatomy & Ocular Physiology 9. Ocular Microbiology & Ocular Biochemistry 10. Physical & Physiological Optics			SEC-1 (SAFE-I)	-	-
IV	11. Ocular Disease-I (Anterior Segment Disease) 12. Ocular Pathology Ocular Pharmacy and Pharmacology 13. Ophthalmic and Optical Instrumentation and procedure 14. Refraction Investigative Ophthalmology		Constitution of India	-	-	-
V	15. Ocular Disease –II (Posterior Segment Disease) 16 Clinical and Advanced orthotics & Optics 17. Community Ophthalmology 18. Contact lens and eye bank			SEC-2 Medical Ethics	-	-
VI	19. Optometric optics & Dispensing optics 20. Contact lens & Occupational optometry 21. Systemic Diseases , Management of OT	-	Quality control	-	-	-
VII	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	Subjects	Theory		Practical		Tutorials		Total	
			hours	**Credits**	hours	**Credits**	hours	**Credits**	Hours	**Credits**
CC-Anatomy	Paper-I A201	General Anatomy, Histology & Embryology	30	**02**	30	**01**	30	**01**	90	**04**
	Paper –II A202	Systemic Histology & Gross anatomy	30	**02**	30	**01**	30	**01**	90	**04**
CC-Physiology	Paper-I A204	Physiological functions of the body	30	**02**	30	**01**	30	**01**	90	**04**
	Paper –II A205	Physiology of hormonal and regulatory function	30	**02**	30	**01**	30	**01**	90	**04**
CF-Compulsory foundation course	A207	Basic computer application	30	**02**	30	**01**	-	-	60	**03**
		Total	170	**11**	150	**05**	120	**04**	440	**19**
	A208 A209	Discipline specific electives (DSE)	Anatomy*	1 Histology Techniques preparation of slides & stains (01 credit) 2 Museum preparation (01 credit)						**01**
	A210		Physiology *	1 ECG (01 credit)						
	A211			2 Pulmonary function test (01 credit)						
				Grand Total						**20**

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

First semester distribution of marks- CBCS scheme

Subject	Paper &code	Subject	Theory	Theory IA	Viva voce	Practical	Practical I.A	Grand total	
CC-Anatomy	Paper-I A201	General Anatomy, Histology & Embryology	50	10	-	-	-	60	UNIVERSITY LEVEL EXAM
	Paper –II A202	Systemic Histology & Gross anatomy	50	10	-	-	-	60	
	A203	Anatomy common Practical	-	-	30	40	10	80	
CC-Physiology	Paper-I A204	Physiological functions of the body	50	10	-	-	-	60	
	Paper –II A205	Physiology of hormonal and regulatory function	50	10	-	-	-	60	
	A206	Physiology common Practical	-	-	30	40	10	80	
Compulsory foundation course	A207	Basic computer application	50	-	-	20	-	70	
Discipline specific electives (DSE)	A208	Histology Techniques preparation of slides & stains	30	-	-	-	-	30	
	A209	Museum preparation							
	A210	Electrocardiogram (ECG)							
	A211	Pulmonary Function Test (PFT)							
			280	40	60	100	20	500	

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 separate physiology 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.

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 PROGRAMME 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	-	
	Compulsory foundation course	1. Basic Computer Application	03

SEMESTER-I
B.Sc. Allied Health Science Programme
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. Lippin cott. Philadelphia.
5. Bhatnagar Essentials of Human Embryology –Revised Edition Orient Blackswan Pvt.Ltd.
6. B.D.Chaurasia Human anatomy CBS publishers
7. Patrick W.Tank and Thomas R Gest Atlas of anatomy Lippincot williams and Wilkins
8. Hollinshed Text book of Anatomy Harper and Row Publishers
9. Willium J Larson Human embryology 3rd edition Churchill Living stone
10. Indebir Singh. Human neuro Anatomy Jaypee brothers
11. Halim A Surface and Radiological Anatomy CBS publishers

SEMESTER-I

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

Theory lectures: 30

Unit –1

Blood **10 hours**

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

Unit-2

Renal System **05 hours**

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

Unit-3

Digestive System **05 hours**

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

Unit-4

Cardiovascular System **05 hours**

List the Properties of cardiac muscle, conducting system of heart. List the events of Cardiac cycle & Heart sounds. Define Cardiac output and give normal value. Effect of exercise on heart. List the

mechanism of Regulation blood pressure. Electrocardiogram-physiological basis and applications. Defined shock signs and symptoms of hypovolemic shock

Unit-5

Respiratory System **05 hours**

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

PRACTICAL

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

Hematology Experiments

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

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

Theory lectures: 30

Unit –1

Muscle And Nerve Physiology **02 hours**

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

Unit-2

Endocrinology **09 hours**

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

Unit-3

Reproductive System **05 hours**

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

Unit-4

Central Nervous System **09 hours**

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

Unit-5

Special Senses **05 hours**

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

PRACTICAL

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

Clinical Physiology

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

Reference Books Physiology

1. Guyton (Arthur) Text Book of Physiology. Latest Ed. Prism publishers
2. Chatterjee(CC) Human Physiology Latest Ed. Vol-1, Medical Allied Agency
3. Choudhari (Sujith K) Concise Medical Physiology Latest Ed. New Central Book,
4. Ganong (William F) Review of Medical Physiology. Latest Ed . Appleton
5. Pal G.K. Text book of Medical physiology Avichal publishing company
6. Campbell FJM Clinical physiology ELBS
7. Schmidi R.F. and Thews G Human physiology Springer verlong
8. Parvathi Pal A text book of practical physiology

SEMESTER-II

Papers

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

Second semester distribution of hours and credit- CBCS scheme

Subject	Paper	Subjects	Theory		Demonstrations/ assignments		Tutorials		Total	
			hours	**Credits**	hours	**Credits**	hours	**Credits**	Hours	**Credits**
Core course (CC)	Paper-I B201	Elementary aspects of biochemistry	40	**02**	40	**01**	40	**02**	160	**05**
	Paper-II B202	Elementary microbiology.	40	**02**	40	**01**	40	**02**	160	**05**
	Paper-III B203	Basics of general ,systemic, clinical, hematology and histopathological technique	40	**02**	40	**01**	40	**02**	160	**05**
Compulsory foundation Course (FC)	B204	English for communication	30	**02**			-	**-**	30	**02**
Ability enhancement course (AEC)	B205	Environmental science	30	**02**	Field visit-	**01**	-	**-**	30	**03**
		Total	180	**09**	240	**07**	120	**03**	540	**20**
Discipline specific electives (DE)	B206 B207	Biochemistry*		1 Basic aspects of research (01) credit 2 Sample collection, preservation and transportation (01 credit)						**01**
	B208 B209 B210	Microbiology*		1. Sterilization and disinfection (01 credit) 2. Antibiotic resistance (01 credit) 3. Specimen collection and transportation (01 credit)						
	B211 B212	Pathology*		1.Phlebotomy (01 credit) 2. Museum Technology (01credit)						
				Grand Total						**21**

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

Second semester distribution of marks- CBCS scheme

Subject	Paper/code	Subjects	Theory				Practical			
			Theory	Viva voce	I.A	Sub total	Practical	I.A	Sub total	Grand total
CC Bio chemistry	Paper-I B201	Elementary aspects of biochemistry	80	-	20	100	-	-	-	100
CC Micro biology	Paper-II B202	Elementary microbiology.	80	-	20	100	-	-	-	100
CC Pathology	Paper-III B203	Basics of general ,systemic, clinical, hematology and histopathological technique	80	-	20	100	-	-	-	100
Compulsory foundation course (CF)	B204	English for communication	50	-	-	50		-	-	50
Ability enhancement course (AEC)	B205	Environmental science-	60-	--	20	80	--	-	-	80
Discipline specific electives (DE)	B206 Biochemistry B207	1. Basic aspects of research 2.Sample collection, preservation and transportation	30	-	-	30	-	-	-	30
	B208 B209 B210	1.Sterilization and disinfection 2.Antibiotic resistance 3.Specimen collection and transportation								
	B211 Pathology B212	Phlebotomy (01 credit) 3.Museum Technology (01credit)								
		Total	**380**		**80**	**460**	**-**	**-**	**-**	**460**

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

DETAILS OF THE COURSES

I. CORE COURSES- BIOCHEMISTRY

1. Elementary aspects of Biochemistry.

Discipline specific elective biochemistry

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

II CORE COURSES – MICROBIOLOGY

1. Elementary Microbiology.

Discipline specific elective Microbiology

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

Ability enhancement course

1. Environmental Science

Compulsory foundation course

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 PROGRAMME STRUCTURE

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

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

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

Credits (Theory 02, Demonstration 01)

Theory lectures: 40

Unit –I **04hour**

Laboratory hazards and its prevention

Common laboratory accidents and ways for its prevention. First Aid in the Clinical laboratory, Laboratory precautions, storage and handling of dangerous chemicals, safety measures. Conventional and SI Units

Unit-2 **02 hours**

Definition of Atomic weight, Molecular weight and Equivalent weight of elements and compounds

Unit-3 **05 hours**

Normality, Molarity, Molality – definition and preparation of solutions with examples

Unit 4

Acids and Bases **06hour**

Definition. Properties, theories, Classification, examples of strong and weak acids.

Basic concepts of Acid base reaction, Ionization of water, pH- definition, Henderson's Hassel Bach's equation, its applications and measurement.

Unit-5 **02hour**

Indicators

Definition, concepts, mechanisms of an indicator, use and its limitations, Commonly used indicators and their pH range. Ideal pH indicators used in different titrations. Universal indicators

Unit-6: **04hour**

Buffers

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

Unit-7 **02hour**

Normal values and its interpretations

Unit 8 **06hour**

Biophysics

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

Unit-9 **05hour**

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

Unit 10 **04hours**

Quality control

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

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

Demonstrations **(01 credit)**

Unit-1 **08 hours**

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

Cuvettes (Types, precautions, uses and limitations)

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

Unit-2 **12 hours**

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

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

Unit-3 **4 hour**

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

Unit –4 **4 hour**

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

Unit-5 **4 hour**

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

Unit-6 **02 hours**

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

Unit-7 **02 hours**

Normal values & interpretations –
(Normal reference range)

Reference Books Biochemistry

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

SEMESTER-II
B.Sc. Allied Health Science Programmes Syllabus
Subject: Microbiology
Paper Title: (Elementary Microbiology)

Credits (Theory 02, Demonstration 01)

Theory lectures: 40

Unit-1 **05 hour**

Bacterial cell*: Anatomy, labeled diagram,

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

Unit-2 **06 hour**

Sterilization & Disinfectants* :

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

Unit-3 **03 hour**

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

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

Unit-4 **02 hour**

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

Unit-5 **04 hour**

Hypersensitivity*

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

Unit-6 **02 hours**

Bacterial infections / diseases: *

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

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

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

Unit-7 **08 hours**

Viral infections / diseases:*

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

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

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

Unit-8 **02 hour**

Fungal infections / diseases :*

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

- Candida,
- Cryptococcus,

- Aspergillus,
- Penicillium,
- Mucor ,
- Rhizopus

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

Unit-9 **04 hours**

Parasitic infections / diseases :*

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

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

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

Describe the preventive & control measures against the heliminths

Unit-10 **04 hours**

Bio safety

Describe the standard precautions to be followed in the work place

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

Note: * these chapters can be asked for long essay

Electives:

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

Reference Books Microbiology

1. Ananthanarayana & Panikar Text book of Medical Microbiology Universities press
2. Text book of Microbiologgy by C.P.Baveja
3. Chatterjee- Parasitology – Interpretation to clinical medicine.
4. Basic laboratory methods in Parasitology, 1st Ed, J.P.boros, New Delhi-199.
5. Basic laboratory procedures in clinical bacteriology 1st Ed, JP.Brothers, New Delhi.

6. Practical microbiology methods for LAB Technicians.
7. Bhatia R : Essentials of medical Microbiology Jay pee New delhi
8. Vandepitte J Basic laboratory procedures in clinical bacteriology Jay pee publications
9. Colle JG Practical Medical Microbiology USA
10. Chatterjee K D parasitology Chatterjee medical publishers

SEMESTER-II

B.Sc. Allied Health Science Programmes Syllabus

Subject: Pathology

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

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

Unit-1
(Basics in General Pathology)

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

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

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

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

Unit-4
(Clinical Pathology)

Urine examinations
Collection and transport of various clinical specimens

Unit-5 (Techniques in pathology)

Basics in tissue processing, FNAC, staining techniques.

DEMONSTRATIONS

Hemoglobin estimation.

Erythrocytes sedimentation Rate (ESR)

Urine examination

H&E staining

Blood grouping

Rh typing

Reference Books Pathology

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

Semester-III

Papers

1. Ocular Anatomy & Ocular Physiology
2. Ocular Microbiology & Ocular Biochemistry
3. Physical & Physiological Optics
4. Skill Enhancement course (SAFE-i)

Third semester B.Sc. in Ophthalmic Technology & Optometry 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 C201	Ocular Anatomy & Ocular Physiology	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-II C202	Ocular Microbiology & Ocular Biochemistry	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-III C203	Physical & Physiological Optics	40	**02**	40	**01**	40	1	40	**02**	160	**06**
Skill enhancement course (SEC)	C204	*Safe - i*	30	**03**	-	**-**	-	-	-	**-**	30	**03**
		Total	150	**09**	120	**03**	120	03	120	**06**	510	**21**

B.Sc. in Ophthalmic Technology & Optometry 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 C201	**Ocular Anatomy & Ocular Physiology**	**100**	**30**	**20**	**150**	**40**	**10**	**50**	**200**
		Section-A Ocular Anatomy	50	15	10	75	20	5	25	100
		Section-B Ocular Physiology	50	15	10	75	20	5	25	100
	Paper-II C202	**Ocular Microbiology & Ocular Biochemistry**	**100**	**30**	**20**	**150**	**40**	**10**	**50**	**200**
		Section-A Ocular Microbiology	50	15	10	75	20	5	25	100
		Section-B Ocular Biochemistry	50	15	10	75	20	5	25	100
	Paper-III C203	**Physical & Physiological Optics**	**100**	**30**	**20**	**150**	**40**	**10**	**50**	**200**
Skill enhancement course (SEC)	C204	*Safe - i*	50	-	-	50	-	-	-	50
		Total	**350**	**90**	**60**	**500**	**120**	**30**	**150**	**650**

THIRD SEMESTER PROGRAMME STRUCTURE

Semester	Course Opted	Course Name	Credits
Third Semester	**Core courses-**	**Ocular Anatomy & Ocular Physiology**	06
		Ocular Microbiology & Ocular Biochemistry	06
		Physical & Physiological Optics	06
	Skill Enhancement course	SAFE i	03

SEMESTER-III
B.Sc. in Ophthalmic Technology & Optometry programme Syllabus
Paper 1 Subject: Ocular anatomy and Physiology
(Section-A and Section B)
Credits (Theory 02, Practical 02, Demonstrations 1)

Total Theory 40 hours

Section A

Ocular Anatomy **Theory 20 hours**

Introduction of human body, cell and various tissue of the body,Embryology and development, Embryology of the eye in general, Orbit and its immediate relations , Lids and eye lid glands, Conjunctiva. Cornea and Sclera , Iris and Ciliary body , Lens and Vitreous , Retina & Choroid , Ocular Muscles , Visual pathways , Sympathetic and parasympathetic system , Vascular supply of eye, Lacrimal apparatus, Higher visual centres.

Practical:

Ocular anatomy **20 Hours**

1. Introduction of human body, cell and various tissue of the body
2. Embryology and development of eye
3. Section of Eye ball
4. Sections of Brain

Section B –

Ocular Physiology **Theory 20 Hours**

Central Nervous System , Brain & Cranial Nerves ,Autonomic nervous system ,
The Food, Vitamins & Protein,

General physiology of the eye - An introduction , Protective mechanism in the eye. Eye lid lacrimation descriptive of the globe, Maintenance of Transparency of the Cornea , Maintenance of Transparency of the Lens , Retina structure and functions, Visual acuity and form sense, The visual stimulus refractive errors, Pupillary reflexes, Crystalline lens and Accommodation.

Convergence,Intra Ocular Pressure, Vision –general aspects of sensation. Night Vision ,Colour Vision and colour vision defects, Visual Fields, visual pathways central and cerebral connections, lesions of pathways and effects, Extrinsic Muscles, Actions and Ocular Movements, Higher Visual Centres and righting reflexes, Visual perception binocular vision stereoscopic vision optical illusion,.Electrophysiological Aspects, Conjugate and Disguate - Movements of the eye

Practical:

Ocular physiology **20 Hours**

1. Visual pathways
2. Extra ocular muscles
3. Binocular vision
4. Retinal correspondence (Normal and abnormal)

SEMESTER-III
B.Sc. in Ophthalmic Technology & Optometry programme Syllabus
Paper II Subject: Ocular Microbiology and Biochemistry
(Section-A and Section B)
Credits (Theory 02, Practical 02, Demonstrations 1)

Total Theory 40 hours

20 hours

Section A: Ocular Microbiology **Theory 20 Hours**

Introduction to Microbiology

classification,

Gram Positive Bacteria,

Gram Negative Bacteria ,

Fungi -saprophytic and pathogenic ,

Virus, Aseptic techniques ,

Chlamedia& parasites

Practical:

Ocular Microbiology **20 Hours**

1. Introduction to Microbiology: Culture media, Classification, Morphological, Lab. diagnosis of infection
2. Collection of samples
3. Serology
4. Culture media for bacteria, fungi and viruses
5. Oxidase test
6. Mantoux test
7. Staining procedures: Gram Staining
8. Staining procedures: Romanowsky stains

9 Staining procedures: ZiehlNeelsen's staining

Section B: Ocular Biochemistry **theory 20hours**

Biochemistry of anterior segment of eye

Unit-1

Fundamentals of Biological macromolecules glycosaminoglycan, proteins (collagen – plasma proteins – Muscle proteins)

Unit-2

Ophthalmologic ally important vitamins A, B, C, E and inositol & regularly mechanisms. Importance of ocular biochemistry in clinical optometric practice

Unit-3

Tear film – composition – lipid layer – aqueous layer – mucoid layer- functions-dysfunction- diagnostic tests –tear substitutes- recent development.

Unit-4

Cornea – biochemical composition of epithelium – bowman's layer – stroma – descendants layer – endothelium – functions – corneal metabolism– nutrient uptake energy – transparency – barrier mechanism –pump action – irrigating solutions – aging and other anomalies – recent developments.

Unit- 5

Lens – composition – metabolism – glucose utilization – sorbitol pathways – glutathione and ascorbic acid transport – transparency – cataract formation - aging photo oxidation – sugar cataract – cataract and ascorbic acid act medical therapy – recent developments.

Unit- 6

Aqueous humour –composition – function –ciliary body – aqueous humour production – IOP- Glaucoma

Biochemistry of Posterior segment of eye **10hours**

Unit-1

Vitreous humour –structure – composition functions – vitreous biochemical pathology – intraocular gels – recent developments

Unit-2

Retina – Pigment epithelium – structure – composition – photoreceptor cells – rhodopsin – lipids renewal – inner segment Pigment epithelium – choroid – metabolism and function – phagocytosis –

Vitamin A-retinal function and metabolism. Retinal neurochemistry Monoamines – acetyl choline – GABA – amino acids – taurine – neuropeptides Biochemical correlates of retinal diseases.

Practical:

Ocular Bio-Chemistry **20hours**

1 Sampling and Collection of Blood.

2.Biochemical tests for carbohydrates, proteins and lipids

3 Analysis of normal and abnormal constituents of urine

4.Spectrophotometry

5.Estimation of blood sugar

6.Ketone bodies in urine

7.Estimation of Serum-cholesterol

SEMESTER-III
B.Sc. in Ophthalmic Technology & Optometry programme Syllabus
Paper III Subject: Physical and Physiological Optics
Credits (Theory 02, Practical 02, Demonstrations 1)

Physical and Physiological Optics **Theory 40 hours**

Unit-1

Elementary basis of light- Interference, diffraction, polarization spectrum, surface tension, viscosity , Principles of Refraction,

Unit-2

Physical Optics

1, Lens Shapes -Convex, Concave ,

2, Thin Lens equation, thick lens equation ,

3, Front and back vertex power ,

4. Aberrations,

5. Spherical, Cylindrical &Toric surfaces, Aspheric surfaces, Prisms -definition, uses, nomenclature, apex ,

Determination of focal length &diopteric power of lens ,Strum's Conoid, Neutralization of lenses ,Schematic eye ,Emmetropia &Ammetropia -Aetiology, Population, Distribution,Growth of eye, Myopia, Hypermetropia, Astigmatism, Aphakia/Pseudo-phakia, Presbyopia, Keratoconus, Post-Operative. Refractive errors, Refraction of irregular reflex,

Accommodation & Convergence-1, Far point, near point, range, amplitude of accommodation ,

Accommodation& Convergence -2. Methods of measurements, AC/A ratio

Retinoscopy -Principle & Methods , Objective Refraction, Subjective Refraction

Practical

Orthoptics **20hours**

1. Latent squint work-up
2. Synptophore
3. Maddox wing
4. Maddox rods
5. Prism bar
6. Near point of accommodation
7. Near point of convergence
8. Fusion exercises

Practical

Optics **20hours**

1. Workshop
2. Spectacle Lens
3. Bifocal Lenses
4. Measurement for ordering spectacle, IPD, Marking centration, V. D. Calculation
5. Refraction under the supervision

SEMESTER-IV

Papers

1. Ocular Disease –I (Anterior segment Disease)
2. Ocular Pathology, Ocular Pharmacy and Pharmacology
3. Ophthalmic and optical instrumentation and procedure
4. Refraction Investigative Ophthalmology
5. Ability enhancement Compulsory Course **(**AECC)
   Constitution of India

Fourth semester B.Sc. in Ophthalmic Technology & Optometry 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 D201	Ocular Disease-I (Anterior Segment Disease)	40	**02**	-	**-**	40	1	40	**02**	160	**05**
	Paper-II D202	Ocular Pathology Ocular Pharmacy and Pharmacology	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-III D203	Ophthalmic and Optical Instrumentation and procedure	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-IV D204	Refraction Investigative Ophthalmology	40	**02**	40	**01**	40	1	40	**02**	160	**06**
AECC	D205	Constitution of India	30	**02**							30	**02**
		Total	190	**010**	160	**04**	160	04	160	**08**	670	**25**

Fourth semester B.Sc. in Ophthalmic Technology & Optometry 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
	Paper-I D201	Ocular Disease-I (Anterior Segment Disease)	80	30	20	130	-	-	-	130
Core course (CC)	Paper-II D202	**Ocular Pathology, Ocular Pharmacy and Pharmacology**	**80**	**30**	**30**	**140**	**40**	**20**	**60**	**200**
		Section-A Ocular Pathology	40	15	15	70	20	10	30	100
		Section-B Ocular Pharmacy and Pharmacology	40	15	15	70	20	10	30	100
	Paper-III D203	Ophthalmic and Optical Instrumentation and procedure	80	30	20	130	40	10	50	180
	Paper-IV D204	Refraction Investigative Ophthalmology	80	30	20	130	40	10	50	180
AECC	D205	Constitution of India	50	-	-	50	-	-	-	50
		Total	**370**	**120**	**90**	**580**	**120**	**40**	**160**	**740**

FOURTH SEMESTER PROGRAMME STRUCTURE

Semester	Course Opted	Course Name	Credits
		1. Ocular Disease-I (Anterior Segment Disease)	05
Fourth Semester	**Core courses- Microbiology**	**2. Ocular Pathology Ocular Pharmacy and Pharmacology**	06
		3. Ophthalmic and Optical Instrumentation and procedure	06
		4. **Refraction Investigative Ophthalmology**	06
	AECC	Constitution of India	02

SEMESTER-IV
B.Sc. in Ophthalmic Technology & Optometry program
Syllabus
Paper I Subject: Ocular Disease-I (Anterior Segment Disease)
Credits (Theory 02, Practical 02, Demonstrations 1)

Ocular Disease-I — Theory 40 hours

Anterior segment ocular diseases involving orbit, eyelids, adnexa, conjunctiva, cornea, urea, sclera, anterior chamber, iris and lens. Symptomatology, clinical signs, diagnosis, pathogenesis, pathophysiology , systemic disease relationships and treatment of degenerative, infections and inflammatory conditions affecting these structures.

Disease of the Lids – Congenital Deformities of the Lids .Oedema of the Lids. Inflammatory Conditions of the Lids. Deformities of the Lid Margins. Deranged Movement of the Eyelids. Neoplasm's of the Lids. Injuries of the Lids.

Diseases of the Lachrymal Apparatus-. Dry Eye. Disease of the Lachrymal Gland. Disease of the Lachrymal Passages. Operations for Chronic Dacryocystitis. Disease of the Conjunctiva- Subconjunctival Haemorrhage Infective Conjunctivitis. Follicular Conjunctivitis. Granulomatous Conjunctivitis. Allergic Conjunctivitis. Conjunctivitis Associated with Skin conditions. Degenerative conditions of the Conjunctiva. Vitamin- A Deficiency. Cysts and Tumours of the Conjunctiva. Conjunctival Pigmentation . Injuries of the Conjunctiva.

Disease of the Cornea –Congenital Anomalies. Inflammation of the Cornea (Keratitis). Superficial Keratitis. Deep Keratitis. Vascularisation of Cornea. Opacities of the Cornea. Keratoplasty. Corneal Degenerations. Corneal Dystrophy's. Corneal Pigmentation. Corneal Injuries. Refractive Corneal Surgery. Corneal Ulcer (Bacterial , Viral , Fungal)

Disease of the Sclera- Episcleritis. Scleritis. Staphyloma of the Sclera. Blue Sclerotic Scleromalacia Performs. Nanophthalmos. Injuries of the Sclera.

Disease of the Iris.-. Congenital Anomalies. Inflammations (Anterior Uveitis) . Specific Types of Iriodocyclitis . Degenerations of the Iris. Cysts and Tumours of the Iris. Injuries of the Iris.

Disease of the Celery Body- Inflammations of the Celery Body. Purulent Iriodocyclitis (Panophthalmitis) . Evisceration . Sympathetic Opthalmia. Vogt- Koyanagi – Harada Syndrome. Tumours of the Celery body. Injuries of the Celery body.

Glaucoma- . Formation of Aqueous Humor. Drainage of Aqueous. Intraocular Pressure(IOP) . Ocular Rigidity. Tonography. .Developmental Glaucoma (Buphthalmos) . Primary Narrow Angle Glaucoma. Primary Open Angle Glaucoma. Normotensive Glaucoma . Ocular Hypertension . Secondary Glaucoma. Surgical Procedures for Glaucoma(Steps Only) ,YOGPI ,trabeculectomy.Laser Procedure in Glaucoma . Artificial Drainage Devices in Glaucoma Surgery(Molteno).

Disease of the Lens- Congenital Malformations. Cataract . Congenital and Developmental Cataract Senile Cataract. Traumatic Cataract. Complicated Cataract. Secondary Cataract . After Cataract. Dislocation of the Lens. SurgicalProcedures for Removal of the Lens(Operative Steps Only). Phacoemulsification(ICCE,ECCE,IOL) . Small Incision Cataract Surgery (Manual Phaco).Intraocular Lens Implantation-AC+PC, IOL.

SEMESTER-IV
B.Sc. in Ophthalmic Technology & Optometry program
Syllabus
Paper II Subject: Ocular Pathology Ocular Pharmacy and Pharmacology
(Section A Ocular Pathology, Section B Ocular Pharmacy and Pharmacology)
Credits (Theory 02, Practical 02, Demonstrations 1)

Ocular Pathology, Ocular Pharmacy and Pharmacology **Theory 40 hours**

Section A : Ocular Pathology

Unit 1

General Introduction

1. Inflammation and repair
2. Ophthalmic wound healing
3. Infections (tuberculosis, leprosy, syphilis, fungus, virus, Chlamydia)
4. Intraocular tumors (retinoblastoma, choroidal melanoma)
5. Optic nerve (normal and tumors)
6. Hematology (anemia, Leukemia and bleeding disorders) clinical pathology examination of urine-(collection methods, Physical Examination, Chemical Examination and Microscopic Examination) and blood smears.
7. Eyelid (normal and pathology including inflammations and tumors)
8. Cornea (normal and pathology in degeneration and dystrophies)
9. Lens (normal and pathology of cataract)
10. Retina (normal and pathology in inflammatory disease, infections)
11. orbit (inflammation and neoplasia)

PRACTICAL

1. Urine collection methods
2. Physical Examination of Urine
3. Chemical Examination of Urine
4. Microscopic Examination of Urine

COURSE CONTENTS FOR BSc OPHTHALMIC TECHNOLOGY & OPTOMETRY
Section B - Ocular Pharmacy and Pharmacology
BATCH 2016 -2017 onwards CBCS

Pharmacology Theory topics and hours

Topics	Must know	Desirable to know	Nice to know	Hours 20	Marks 40
Unit 1: Ocular Pharmacology	√			**3**	**15**
Introduction	√				
Routes of drug administration	√			**3**	
Unit 2: Autonomic nervous system					
Miotics, Mydriatics and Cycloplegic drugs					
Drugs used in glaucoma	√			**2**	
Unit 3: Local anaesthetics	√			**2**	
Unit 4: Anti-inflammatory drugs and analgesics					
Non steroidal anti-inflammatory drugs					
Corticosteroids					
Opioids (Tramadol, Morphine, Fentanyl)					
Unit 5: Antimicrobials				**4**	**15**
Drugs used in bacterial infections	√				
Drugs used in viral and fungal infections		√			
Unit 6: Preparations used in eye	√			**4**	**07**
Dyes, Preservatives, Lubricants					
Irrigating solutions, Contact lens solution					
Antiseptics and disinfectants					
Unit 7: Immunosuppressive agents			√	**1**	**03**
Unit 8: Chelating agents		√		**1**	

Tutorials: 20 hours

COURSE CONTENTS FOR BSc Ophthalmic Technology & Optometry
Second Year IV semester
Section B - Ocular Pharmacy and Pharmacology
BATCH 2016 -2017 onwards CBCS

Pharmacology Practical topics and hours

Topics	Must know	Desirable to know	Hours 20	Marks 20
Unit 1: Experimental Pharmacology				
1.Demonstrating effect of drugs on eye using charts	√		**06**	**06**
a) Pilocarpine	√			
b) Homatropine	√			
c) Phenylephrine	√			
d) Lignocaine				
2. Chemical tests			**04**	**07**
a) Test for Iodides	√			
b) Steroid detection test	√			
c) Test for gentamicin	√			
d) Test for paracetamol	√			
Unit 2: Clinical Pharmacology				
1. Dosage forms – Eye drops			**10**	**07**
a) Methylcellulose	√			
b) Glycerin	√			
c) Dexamethasone	√			
d) Ciprofloxacin	√			
e) Chloramphenicol applicaps	√			
f) Timolol	√			
g) Diclofenace	√			
h) Latanoprost	√			
i) Olapatadine	√			
j) Flurbiprofen				

Table of specification FOR BSc Ophthalmic Technology & Optometry

Second Year IV semester
BATCH 2016 -2017 onwards CBCS
Section B - Ocular Pharmacy and Pharmacology

Chapter wise distribution of types of Questions and Marks will be as under

The pattern of questions would be of three types

Chapter/Topic	**Type and No. of Questions**	**Marks 40**
Routes of drug administration, Drugs used in glaucoma , Local anesthetics, Anti-inflammatory drugs and analgesics - Non steroidal anti-inflammatory drugs Corticosteroids, Opioids (Tramadol, Morphine, Fentanyl), Drugs used in bacterial infections	Long Essay 1X10	10
Routes of drug administration, Miotics, Mydriatics, and cycloplegic drugs, Drugs used in glaucoma, Local anaesthetics, Anti-inflammatory drugs and analgesics - Non steroidal anti-inflammatory drugs Corticosteroids, Opioids (Tramadol, Morphine, Fentanyl), Drugs used in bacterial infections, Ocular lubricants	Short Essay 3X5 (Answer any 3)	15
Drugs used in viral infections, fungal infections, Ophthalmic dyes, preservatives, Ocular lubricants and irrigating solutions, Ocular antiseptics and disinfectants, Contact lens solutions	Short Answer 5X3 (Answer any 5)	15

Scheme of Examination for BSc Ophthalmic Technology & Optometry
Second Year IV semester
BATCH 2016 -2017 onwards CBCS
Section B - Ocular Pharmacy and Pharmacology

Internal assessment

Theory: 15 Marks

Practical: 10 Marks

University examination

Theory: The pattern of question paper is as follows for 40 marks paper

Type of questions	Number of questions	Marks for each questions	Total
Long Essay	1 (No choice)	10	10
Short Essay	4 (Answer any three)	05	15
Short Answer Questions	6 (Answer any five)	03	15
Total Marks			40

Practical:

Distribution of marks for practical examination – 20

Topic	Marks
Experimental Pharmacology	13
Clinical Pharmacology	07
Total marks	20

Viva Voce Examination – 15 marks

Topic	Marks
Routes of drug administration, Drugs used in glaucoma, Local anesthetics, Anti-inflammatory drugs and analgesics and Drugs used in bacterial infections	08
Miotics, Mydriatics, and cycloplegic drugs, Drugs used in viral infections, fungal infections, Ophthalmic dyes and preservatives, Ocular lubricants and irrigating solutions, Ocular antiseptics and disinfectants, Contact lens solutions	07
Total marks	15

Examination components and distribution of marks for
Second Year IV semester
BATCH 2016 -2017 onwards CBCS
Section B - Ocular Pharmacy and Pharmacology

A	**THEORY**	
1.	Written paper No. of papers Maximum marks	 One 40
2.	Viva-Voce	15
3.	Internal Assessment (Theory)	15
	Total Theory	**70**
B	**PRACTICAL**	
1.	Practical	20
2.	Internal Assessment (Practical)	10
	Total Practicals	**30**
	Grand Total	**100**

RECOMMENDED TEXTBOOKS

1. Gupta SK, Agarwal R, Srivastava S. Clinical Ocular Pharmacology and Therapeutics, 1st edition, Jaypee Brothers, New Delhi 2014
2. K.D. Tripathi. Essentials of Medical Pharmacology,7th edition, Jaypee Brothers, New Delhi 2013
3. RS Satoskar, Nirmala Rege, SD Bhandarkar. Pharmacology and Pharmacotherapeutics. 24th edition, Elsevier India Gurgaon 2015

SEMESTER-IV
B.Sc. in Ophthalmic Technology & Optometry programme
Syllabus
Paper III Subject: Ophthalmic and optical Instrumentation and procedure
Credits (Theory 02, Practical 02, Demonstrations 1)

Ophthalmic and Optical Instrumentation and procedure Theory 40 hours

- Detailed study of the Principles of operation, types, optical properties, constructions, adjustments and
- applications of the following Instruments and Devices:
- Binoculars, telescopes and projectors.
- Simple and Compound Microscopes (with Huygens and Ramsden Eye pieces and oil immersion objectives).
- Spectrometer.
- Radiuscope
- Retinoscopes
- Standard Tests Charts.
- Autorefractometer- subjective and objective types
- Opthalmoscopes- direct and indirect types.
- Refractometers- Auto refractors, Dioptron
- Slit lamp Biomicroscope
- Keratometer
- Lensometer
- Trial case lenses-best forms.
- Trial frame design.
- Cross cylinder.

Principles, clinical use (methods) & significance of following instruments:

- Tonometer – Principles, types, clinical importance as a routine procedure (application)
- Pachometer – Principles, types, clinical importance
- Devices for color vision testing – CS testing / Glare testing.
- Ultrasonography – (A scan, B scan) – Principles and application.
- F.F.A – Principles and demonstration of film.
- PAM – Principles and importance.
- Perimeter – Basics of perimetry – Humphray instruments, Automated perimetry – basics, types(names) ,
- interpretation of normal Glaucoma Field of Definition.
- LASER – Introduction – Einstein co-efficient, population inversion.
- Different types of LASER (mention) – Excimer, Lasik
- Nd-yag, Argon, Diode, He-Ne gas LASER, Xenon.
- LASER safety, Ophthalmic LASER application(Argon, Yag)

References:

1. Introduction to Visual Optics, Alan H. Tumadiffe(1987)
2. Clinical Optics- 2nd ed (1991)- A.R. Elington & H.J. Frank
3. Optics & Refraction-L.P. Agarwal. 4. Clinical Optics- Borrish.

SEMESTER-IV
B.Sc. in Ophthalmic Technology & Optometry programme
Syllabus
Paper IV Subject: Refraction Investigative Ophthalmology
Credits (Theory 02, Practical 02, Demonstrations 1)

Refraction and Investigative ophthalmology **Theory 40 hours**

Unit1: Refraction

1. Emmetropia&Ammetropia -Aetiology, Population, Distribution, Growth of eye
2. Myopia
3. Hypermetropia
4. Astigmatism
5. Aphakia/Pseudo-phakia
6. Presbiopia
7. Keratoconus
8. Post-Op. Refractive errors
9. Refraction of irregular reflex
10. Accommodation & Convergence –1. Far point, near point, ranges. Amplitude of accommodation
11. Accommodation & Convergence – 2. Methods of measurements, NPA. AC/A ratio
12. Retinoscopy -Principle & Method
13. Objective Refraction
14. Subjective Refraction, Cross Cylinder

Unit2 : Investigative Ophthalmology

1. Orthoptics-General Concept
2. Ocular muscles and movements
3. AC/ A ratio
4. Measurements of angle of squint
5. Latent squint
6. Maddox rod
7. Maddox wing
8. Manifest concomitant
9. Squint concomitant
10. Paralytic Squint
11. Head posture and its significance
12. Hess Screening and its Interpretations
13. Occlusion -types and uses
14. Nystagmus
15. Testing of ARC
16. Amblyopia
17. Disorders of accommodation
18. Paediatric visual acuity assessment
19. Paediatric Refraction
20. Neural aspects of binocular vision

SEMESTER-V

Papers

1. Ocular Disease –II (Posterior Segment Disease)

2. Clinical and Advanced orthotics & Optics

3. Community Ophthalmology

4. Contact lens and eye bank

4. Skill Enhancement course

Medical Ethics

B.Sc. in Ophthalmic Technology & Optometry 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 E201	Ocular Disease –II (Posterior Segment Disease)	40	**02**	-	**-**	-	-	40	**02**	80	**04**
	Paper-II E202	Clinical and Advanced orthotics & Optics	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-III E203	Community Ophthalmology	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-IV E205	Contact lens and eye bank	40	**02**	40	**01**	40	1	40	**02**	160	**06**
Skill enhancement course (SEC)	E206	Medical Ethics	30	**02**	-	**-**	-	-	-	**-**	30	**02**
		Total	190	**10**	120	**03**	160	03	160	**08**	590	**24**

B.Sc. in Ophthalmic Technology & Optometry 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	Ocular Disease –II (Posterior Segment Disease)	80	-	20	100	-	-	-	100
	Paper-II E202	Clinical and Advanced orthotics & Optics	80	-	20	100	-	-	-	100
	Paper-III E203	Community Ophthalmology	80	-	20	100	-	-	-	100
	Paper-IV E205	Contact lens and eye bank	80	-	20	100	-	-	-	100
	E204	Common Practical	-	30	-	30	60	10	70	100
Skill enhancement course (SEC)	E206	Medical Ethics	50	-	-	50	-	-	-	50
		Total	**370**	**30**	**80**	**480**	**60**	**10**	**70**	**550**

FIFTH SEMESTER PROGRAMME STRUCTURE

Semester	Course Opted	Course Name	Credits
Fifth Semester	**Core courses-**	Ocular Disease –II (Posterior Segment Disease)	04
		Clinical and Advanced orthotics & optics	06
		Community Ophthalmology	06
		Contact lens and eye bank	06
	Skill enhancement course (SEC)	Medical Ethics	02

SEMESTER-V
B.Sc. in Ophthalmic Technology & Optometry programme
Syllabus
Paper I Subject: Ocular Disease-II (Posterior segment Disease)

Credits (Theory 02, , Demonstrations 02)

OCULAR DISEASE II (Posterior Segment Disease)

Diseases of the Vitreous Humor- Congenital Anomalies. Vitreous Opacities. Hereditary Vitreo – Retinal Degeneration's. Vitreous Haemorrhage .Detachment of Vitreous Humor . Vitreous Surgery. Methods of clinically assessing the posterior segment (direct & indirect opthalmoscopy)

Disease of the Retina- Congenital & Dev. Defects. Inflammation of the Retina(Retinitis) . Retinal Vasculitis Oedema of the Retina. Haemorrhage of the Retina. Vascular Occlusion . Retinal Arteriosclerosis. Retinopathies . Retinal Telangiectasis. Degeneration's of the Retina. Detachment of the Retina. Surgical Procedures for Retinal Detachment .Tumours of the Retina. Phakomatoses,.
Injuries of the Retina.

Disease of the Optic Nerve- Congenital Anomalies. Papilloedema. Inflammation of the Optic Nerve(Optic-Neuritis). Ischaemic Optic Neuropathy . Optic Atrophy. Tumours of the Optic Nerve. Injuries of the Optic Nerve.

Symptomatic Disturbances of Visual Function – Visual Field Defects . Amblyopia. Amaurosis. Night Blindness. Day Blindness. Defects in Color Vision. Congenital Word Blindness. Malingering.

Neuro –eye disease:

Evaluation of optic nerve disease, Clinical features of optic nerve dysfunction., Optic disc changes. Optic atrophy. Special investigation. Classification of optic neuritis, Optic neuritis and demyelination, Systemic features of multiple sclerosis, Special investigation. Optic neuritis. Other causes of optic neuritis Parainfectious optic neuritis. Infectious optic neuritis. Non-arteritic anterior ischaemic optic neuropathy Arteritic anterior ischaemic optic neuropathy Clinical features of giant cell arteritis. Special investigation. Arteritic anterior ischaemic optic neuropathy. Leber hereditary optic neuropathy Hereditary optic atrophies, Kjer syndrome. Behr syndrome. Wolfram syndrome. Alcohol-tobacco amblyopia Drug-induced optic neuropathies,

PAPILLOEDEMA

Raised intracranial pressure - Causes.Hydrocephalus. Systemic features. Clinical features of papilloedema Differential diagnosis.

SEMESTER-V
B.Sc. in Ophthalmic Technology & Optometry programme
Syllabus
Paper II Subject: Clinical and advanced orthotics & Optics

Credits (Theory 02, Practical 02, Demonstrations 1)

Clinical and advanced orthoptics & optics **Theory 20 hours**

Clinical & Advanced Orthoptics

1. Orthoptic-General concept
2. Ocular muscles and movements
3. AC/ A ratio
4. Measurements of angle of squint
5. Latent squint
6. Maddox rod
7. Maddox wing
8. Synoptophore
9. Manifest concomitant
10. Squint concomitant
11. Paralytic Squint
12. Head posture and its significance
13. Hess Screening and its Interpretations
14. Pleoptics
15. Occlusion -types and uses
16. Nystagmus
17. A. V. Syndromes
18. Testing of ARC
19. Amblyopia
20. Disorders of accommodation
21. Paediatric visual acuity assessment
22. Paediatric Refraction
23. Neural aspects of binocular vision

Clinical & Advanced Optics **Theory 20 hours**

1. Emmetropia&Ammetropia –Aetiology, Population. Distribution, Growth of eye
2. Myopia
3. Hypermetropia
4. Astigmatism
5. Aphakia/Pseudo-phakia
6. Presbiopia
7. Keratoconus
8. Post-Op. Refractive errors
9. Refraction of irregular re/ex
10. Accommodation & Convergence -1. Far point, near point, range, amplitude of accommodation
11. Accommodation & Convergence -2. Methods of measurements. NPA. AC I A ratio.
12. Retinoscopy -Principle & Methods
13. Objective Refraction
14. Subjective Refraction
15. Cross Cylinder

SEMESTER-V
B.Sc. in Ophthalmic Technology & Optometry programme
Syllabus
Paper III Subject: Community Ophthalmology

Credits (Theory 02, Practical 02, Demonstrations 1)

Community Ophthalmology **Theory 40 hours**

1. Concepts of community Ophthalmology - I
2. Concepts of community Ophthalmology - II
3. The Epidemiology of Blindness (General Principles) - I
4. The Epidemiology of Blindness (General Principles) - II
5. The Epidemiology of Blindness (Disease specific strategies) - III
6. The Epidemiology of Blindness (Disease specific strategies) - IV
7. Survey Methodological - I
8. Survey Methodological - II
9. Survey Methodological - III
10. Screening procedures in Ophthalmology – I
11. Screening procedures in Ophthalmology – II
12. School eye screening programme
13. Primary eye care
14. Organization of Outreach services
15. Organization of Reach-in-Programme
16. Information, Education, communication
17. Rehabilitation of the visually handicapped
18. National programme for control of Blindness – I
19. National programme for control of Blindness – II
20. Vision 2020 : The Right to sight

SEMESTER-V
B.Sc. in Ophthalmic Technology & Optometry programme
Syllabus
Paper IV Subject: Contact lens and eye bank
Credits (Theory 02, Practical 02, Demonstrations 1)

Contact lens and eye bank — Theory 40 hours

Contact Lens

1. History of Contact Lens
2. Corneal Anatomy and Physiology
3. Corneal Physiology and Contact Lens
4. Preliminary Measurements and Investigations
5. Slit Lamp Biomicroscopy
6. Contact Lens materials
7. Optics of the Contact Lens
8. Glossary of Terms: Contact Lenses
9. Indications and Contra Indications Contact Lens
10. Rigid gas permeable contact lens design
11. Soft Contact lens design & manufacture
12. Kertometery, Placido's disc, Tonography
13. Fitting philosophies
14. Fitting of Spherical SCL and effect of parameter changes
15. Astigmatism correction options
16. Fitting Spherical RGP contact Lenses, Low OK, High OK
17. Effects of RGP contact Lens parameter changes on lens fitting
18. Fitting in Astigmatism (Sph RGP)
19. Follow-up post fitting examination
20. Follow-up Slit Lamp examination
21. Fitting in Keratoconus
22. Fitting in Aphakia, Pseudophakia
23. Cosmetic Contact Lenses
24. Fitting Contact Lens in children
25. Toric Contact Lenses
26. Bifocal Contact Lenses
27. Continuous wear and extended wear lenses
28. Therapeutic Lenses/Bandage lenses
29. Contact lens following ocular surgeries
30. Disposable contact lenses, frequent replacement and Lenses
31. Care & maintenance of Contact Lenses
32. Contact Lens modification of finished lenses
33. Instrumentation in contact lens practice
34. Checking finished lenses parameters
35. Recent developments in Contact lenses
36. Review of lenses available in India

Eye Bank

1. Publicity
2. How to donate your eyes
3. Collection of eyes
4. Preservation of eyes
5. Pre-operative Instructions
6. Post-operative Instructions
7. Latest techniques for preservation of donor Cornea

COMMON PRACTICAL SEMESTER- V

Community Ophthalmology

Eye Screening Programme & Surveys
Eye camp (approx. 3) of 10 days each
PHC posting

Clinical & Advanced Orthoptics

1. Manifest squint work-up
2. Paralytic squint work-up
3. Pleoptics
4. Orthoptic Exercises

Clinical & Advanced Optics

Refraction and prescription of glasses in independent cabin

Contact Lens

1. Contact Lens fitting
2. Counselling to Contact Lens patient
3. Post-fitting instructions
4. Remedy of post-fitting problems

Clinical & Advanced Refractions

Refraction and prescription of glasses

Eye Bank

1. How to donate your eyes/Counseling 2.Collection of eyes 3. Preservation of eyes

Note: Department can propose any additional practical if required

SEMESTER-VI

Papers

1. Optometric optics & Dispensing optics
2. Contact lens & Occupational optometry
3. Systemic Diseases , Management of OT
4. Ability enhancement Compulsory course (AEC)
   Quality control

B.Sc. in Ophthalmic Technology & Optometry Sixth semester

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 F201	Optometric optics & Dispensing optics	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-II F202	Contact lens & Occupational optometry	40	**02**	40	**01**	40	1	40	**02**	160	**06**
	Paper-III F203	Systemic Diseases, Management of OT	40	**02**	40	**01**	40	1	40	**02**	160	**06**
Ability enhancement compulsory course	F205	Quality control	30	**02**	-	**-**	-	**-**	-	**-**	30	**02**
		Total	150	**08**	120	**03**	120	03	120	**06**	510	**20**

B.Sc. in Ophthalmic Technology & Optometry 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 F201	Optometric optics & Dispensing optics	80	-	20	100	-	-	-	100
	Paper-II F202	Contact lens & Occupational optometry	80	-	20	100	-	-	-	100
	Paper-III F203	Systemic Diseases , Management of OT	80	-	20	100	-	-	-	100
	F204	Common Practical	-	30	-	30	60	10	70	100
Ability enhancement compulsory course	F205	Quality control	50	-	-	50	-	-	-	50
		Total	**290**	**30**	**60**	**380**	**60**	**10**	**70**	**450**

SIXTH SEMESTER PROGRAMME STRUCTURE

Semester	Course Opted	Course Name	Credits
Sixth Semester	**Core courses-**	Optometric optics & Dispensing optics	06
		Contact lens & Occupational optometry	06
		Systemic Diseases , Management of OT	06
	Ability enhancement compulsory course (AECC)	Quality control	02

SEMESTER-VI
B.Sc. in Ophthalmic Technology & Optometry programme Syllabus
Paper I Subject: Optometric optics & Dispensing optics

Credits (Theory 02, Practical 02, Demonstrations 1)

Optometric optics & Dispensing optics Theory 40 hours

OPTOMETRIC OPTICS

A.
1. Form of lenses and base curves
2. Lens tools – Lens blanks
3. Cylindrical lenses - Focal lines- Axis Rotation
4. Sphero Cylinder – Transposition Internal of sturm's circle of least confusion Properties of Cylinder
5. Ophthalmic Prism – Definition Crossed Prism Risely Prism Effectivity Prentice's Rule
6. Spectacle Parameter - Near Visual point Induced and grounded prism Prentice's Rule Decentration of spherical lenses Prismatic effect of pherocylinder
7. Determining lens power Lens clock Sagitta Neutralization with trial lenses Lensometry Cylinder power at opposite axis

B.
1. Obliguly crossed cylinder
2. Magnificatory lenses
3. Tilt induced power
4. Aberration in ophthalmic lenses
5. Agin plus lenses
6. Absorptive lenses
7. Definition – Lenses & Frames
8. Types of Spectacle frames & Lenses
9. Materials used for lenses & Frames
10. Surface power and radius / refractive inter values
11. Toric surface and their uses
12. Best form spectacle lenses
13. Vertex distance and vertex power
14. Outlines of lens surfacing & polishing
15. Ophthalmic prism units and uses
16. Decentration of lenses and edge thickness
17. Prismatic effects of spectacles
18. The process of manufactory of glass, glastym and glass cements
19. Toughered lens

C.
1. Bifocal & multifocal lenses – types & characteristics
2. Bifocal & multifocal lenses – purpose & choice
3. Bifocal trifocal dispensing
4. Focal & frame measurements
5. Tinted lenses & abortive properties
6. Tinted lenses - Examples and discussions
7. Plastic lenses – Types and characteristics
8. Safety and industrial eye protective lenses
9. Special type of spectacles lenses

10. Modern type of lenses – Vari focal lens Lenticular lens Aspheric lens High density lens Iseikonic lens
11. Glass working - Spherical surfaces
12. Glass working - Toric lenses
13. Faculties in lenses - description
14. Faculties in lenses - detection
15. British standards for frames, lenses, eye protectors filters and Terminology
16. Usual lens forms
17. Spectacle magnifiers
18. Recumbent prisms & Fresnel prisms
19. Reflections from spectacle lenses, ghost images, refractions in bifocal at the dividing line.
20. Anti-reflection coating and multi – layer coating
21. Field of view of lenses.

DISPENSING OPTICS –

1. Surfacing and Polishing glass lenses
2. Glazing – Grinding
3. Frame manipulation and repair
4. Facial measurements and frame choice
5. Power and dimension measurements of complete pair of spectacles
6. Complete dispensing for subjects
7. Special lenses - Examination of specimens
8. Lens faults inspection
9. Measurement of assorted faces for spectacles
10. Making and edging bifocal lenses
11. Edging of lenses for plastic, Metal and rimless frames
12. Joining plastics by different solvents
13. Curvature and power measurements of typical contact lenses
14. Edging and polishing peripheral curves of contact lenses

SEMESTER-VI
B.Sc. in Ophthalmic Technology & Optometry programme Syllabus
Paper II Subject: Contact lens & Occupational optometry

Credits (Theory 02, Practical 02, Demonstrations 1)

CONTACT LENS

OBJECTIVES: Upon completion of the course, the student should be able to:
Understand the basics of contact lenses, List the important properties of contact lenses, Finalise the CL design for various kinds patients, Recognize various types of fitting, Explain all the procedures to patient , Identify and manage the adverse effects of contact lens

Syllabus (Total: 30 hours)

1. Introduction to Contact lenses
1.1 Definition
1.2 Classification / Types
2. History of Contact Lenses
3. Optics of Contact Lenses
3.1 Magnification & Visual field
3.2 Accommodation & Convergence
3.3 Back & Front Vertex Power / Vertex distance calculation
4. Review of Anatomy & Physiology of
4.1 Tear film
4.2 Cornea
4.3 Lids & Conjunctiva
5. Introduction to CL materials
5.1 Monomers, Polymers
6. Properties of CL materials
6.1 Physiological (Dk, Ionicity, Water content)
6.2 Physical (Elasticity, Tensile strength, Rigidity)
6.3 Optical (Transmission, Refractive index)
7. Indications and contraindications
8. Parameters / Designs of Contact Lenses & Terminology
9. RGP Contact Lens materials
10. Manufacturing Rigid and Soft Contact Lenses – various methods
11. Pre-Fitting examination – steps, significance, recording of results
12. Correction of Astigmatism with RGP lens
13. Types of fit – Steep, Flat, Optimum – on spherical cornea with spherical lenses
14. Types of fit – Steep, Flat, Optimum – on Toric cornea with spherical lenses
15. Calculation and finalising Contact lens parameters
16. Ordering Rigid Contact Lenses – writing a prescription to the Laboratory
17. Checking and verifying Contact lenses from Laboratory
18. Modifications possible with Rigid lenses
19. Common Handling Instructions

References:

1. IACLE modules 1 - 10

2. CLAO Volumes 1, 2, 3

3. Anthony J. Phillips : Contact Lenses, 5thedition, Butterworth-Heinemann, 2006

4. Elisabeth A. W. Millis: Medical Contact Lens Practice, Butterworth-Heinemann, 2004

5. E S. Bennett ,V A Henry :Clinical manual of Contact Lenses, 3rd edition, Lippincott Williams and Wilkins, 2008

Occupational Optometry

OBJECTIVES: At the end of the course the students will be knowledgeable in the aspects of : visual requirements of jobs; effects of physical, chemical and other hazards on eye and vision; To identify occupational causes of visual and eye problems; To be able to prescribe suitable corrective lenses and eye protective wear and To set visual requirements, standards for different jobs.

Syllabus : (Total: 10 hours)

1. Introduction to Occupational health, hygiene and safety, international bodies like ILO, WHO, National bodies etc.

1.1 Acts and Rules - Factories Act, WCA, ESI Act.

2. Electromagnetic Radiation and its effects on Eye

3. Light – Definitions and units, Sources, advantages and disadvantages, standards

4. Color – Definition, Color theory, Color coding, Color defects, Color Vision tests

5. Occupational hazards and preventive/protective methods

6. Task Analysis

7. Industrial Vision Screening – Modified clinical method and Industrial Vision test

8. Vision Standards – Railways, Roadways, Airlines

9. Visual Display Units

10. Contact lens and work

References:

1. PP Santanam, R Krishnakumar, Monica R. Dr. Santanam's text book of Occupational optometry. 1st edition, Published by Elite School of optometry , unit of Medical Research Foundation, Chennai, India , 2015

2. R V North: Work and the eye, Second edition, Butterworth Heinemann, 2001

3. G W Good: Occupational Vision Manual available in the following website: www.aoa.org

4. N.A. Smith: Lighting for Occupational Optometry, HHSC Handbook Series, Safchem Services, 1999

5. J Anshel: Visual Ergonomics Handbook, CRC Press, 2005

6. G Carson, S Doshi, W Harvey: Eye Essentials: Environmental & Occupational Optometry, Butterworth-Heinemann, 2008

SEMESTER-VI
B.Sc. in Ophthalmic Technology & Optometry programme Syllabus
Paper III Subject: Systemic Diseases, Management of OT

Credits (Theory 02, Practical 02, Demonstrations 1)

Systemic Disease Medicine — Theory 40 hours

1. Systemic Hypertension – Aetiology, Pathogenesis, Pathology, Clinical manifestations, Investigations and treatment
2. Diabetes Mellitus – Aetiopathogenesis, Classification, Clinical features including complications, diagnosis and management
3. Acquired Heart disease – Embolism, Bacterial edocarditis
4. Cancer - Introduction
5. Connective Tissue Disease - SLE, Rheumatoid arthritis, Manfan's syndrome, Osteogenesis imperfecta
6. Thyroid Disease - Hypofunction & Hyperfunction
7. Tuberculosis
8. Helminthiasis - Guineo worm infection
9. Tropical Medical illness, Malaria, Toxoplasmosis, Leprosy
10. Malnutrition and Vitamin deficiency states
11. Immunology - Basic concepts
12. Neurological Disorders - Stroke, Meningitis, Ecephalitis, Demyalinating diseases, Herediatary Ataxias, Intracranial tumors, Head injury, Hydrocephalous, Subacute combine degeneration
13. Genetics - Basic Principles
    Gene structure and function
    Eye Disease
    Generic Counseling
    Generic Engineering
14. General Medical emergencies - First Aid

Management of OT

15. Introduction to Ocular in general
16. Asepsis: How to achieve
17. Anesthetic agents and where indicated
18. 0 T Sterilization procedures
19. Sterilization procedures of 0 T Instruments
20. Maintenance of Instruments and equipments: Ophthalmic Instruments
21. Maintenance of Instruments and equipments: Surgical Instruments
22. Maintenance of Instruments and equipments: Optometric & Contact Lens Equipment

SEMESTER- VI - COMMON PRACTICAL for following papers

1. Optometric optics & Dispensing optics
2. Contact lens & Occupational optometry
3. Systemic Diseases , Management of OT

Note: List the practical relating to above papers by the Department of Ophthalmology

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

THEORY

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

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

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

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

-End-