ರಾಜೀವ್ ಗಾಂಧಿ ಆರೋಗ್ಯ ವಿಜ್ಞಾನಗಳ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕರ್ನಾಟಕ, ಬೆಂಗಳೂರು
RAJIV GANDHI UNIVERSITY OF HEALTH SCIENCES, KARNATAKA, BENGALURU
4th T Block, Jayanagar, Bengaluru - 560 041

No. RGU/ACA/DCD/AHS/OPTO/362(e)/2019-20 Date. 31.03.2022

NOTIFICATION

Sub: Amendment to revised Ordinance Governing Regulations and Curriculum of B.Sc. Optometry -2019.

Ref:
1. Proceedings of the BOS allied Health Science held on 18.11.2021
2. Proceedings of CAC meeting held on 24.11.2021.
3. RGUHS Notification No. RGU/AUTH/OPTO/100/2021-2022, dated 08/11/2021.
4. Proceedings of 168th Syndicate meeting held on 14.03.2022.

* * *

As per the decision of 168th meeting of Syndicate held on 14.03.2022 and in exercise of the powers conferred under Section 35 (2) of RGUHS Act, 1994, the following amendment is proposed in the revised Ordinance Governing Regulations and Curriculum of B.Sc. Optometry - 2019. This amendment shall come into force from the January -2022 examinations and onwards.

Sl. No.	Existing	Amendment
01	For a pass in theory, a candidate shall secure not less than 50% marks in University examination. and For a pass in practical/clinical examination a candidate shall secure not less than 50% marks in University examination.	Second year examinations and Third year Examination a. **Main subjects:** A candidate is declared to have passed the examination in a subject if he/she secures 50% of the marks in Theory and 50% in Practical separately. For a pass in theory, a candidate has to secure 50% in aggregate (a minimum of 40% marks in theory and internal assessment added together) For a pass in Practical, a candidate has to secure 50% in aggregate (a minimum of 40% marks in Practical/Clinical examination and Internal Assessment added together)

		b. **Subsidiary Subjects:** The minimum prescribed marks for a pass in subsidiary subject shall be 35% of the maximum marks prescribed for a subject. The marks obtained in the subsidiary subjects shall be communicated to the University before the commencement of the University Examination.

REGISTRAR

To

The Principals of all affiliated Allied Health Sciences colleges of RGUHS.

Copy to : -

1. PA to Vice-Chancellor/PA to Registrar/Registrar (Eva)/Finance officer RGUHS, Bangalore
2. Deputy Registrar, Admission/Affiliation/Examination, RGUHS, Bangalore
3. Public information officer RGUHS, Bangalore
4. The home page of RGUHS
5. Guard File/office copy

Revised Ordinance Governing Regulations and Curriculum of

B.Sc. OPTOMETRY COURSE- 2019

Rajiv Gandhi University of Health Sciences, Karnataka,Bangalore

The Emblem

The Emblem of the Rajiv Gandhi University of Health Sciences is a symbolic expression of the confluence of both Eastern and Western Health Sciences. A central wand with entwined snakes symbolises Greek and Roman Gods of Health called Hermis and Mercury is adapted as symbol of modern medical science. The pot above depicts Amrutha Kalasham of Dhanvanthri the father of all Health Sciences. The wings above it depicts Human Soul called Hamsa (Swan) in Indian philosophy. The rising Sun at the top symbolises knowledge and enlightenment. The two twigs of leaves in western philosophy symbolises Olive branches, which is an expression of Peace, Love and Harmony. In Hindu Philosophy it depicts the Vanaspathi (also called as Oushadi) held in the hands of Dhanvanthri, which are the source of all Medicines. The lamp at the bottom depicts human energy (kundalini). The script “Devahitham Yadayahu” inside the lamp is taken from Upanishath Shanth i Manthram (Bhadram Karnebh i Shrunuyanadev…), which says “May we live the full span of our lives allotted by God in perfect health” which is the motto of the Rajiv Gandhi University of Health Sciences.

RAJIV GANDHI UNIVERSITY OF HEALTH SCIENCES, KARNATAKA, BENGALURtI
4* T Block, Jayanagar, Bengaluru — 560 041

Be£: ACA/DCD/AHS/OPI'O/S62te)/1019-2O **Date:28/08/2019**

NOTIFICATION

Sub: Revised Ordinance pertaining to Regulation and Curriculum of B.Sc. Optometry,

Ref: 1) Minutes of BOS Allied Health Sciences held on 13/05/2019
2) Proceedings of Faculty meeting held on 15/05/2019
3) Proceedings of AC meeting held on 17/06/2019
4) Proceedings of Syndicate meeting held on 29f06/2O19

In exercise of the powers vested under Section 35(2) of RGUHS Act, 1994, the Revised Ordinance pertaining to Regulation arid the curriculum of B. Sc. Optometry is notified herewith as per Annexure.

The above Regulation shall be applicable to the students admitted to the said course from the academic year 2019-20 onwards.

By Order,
Sd/-
REGISTRAR

To

The Principals of all affiliated Allied Health Sciences Course colleges of RGUHS, Bangalore.
Copy to :

1. The Principal Secretary to Governor, Raj Bhavan, Bangalore - 560001
2. The Principal Secretary Medical Education, Health & Family Welfare Dept., M S Building, Dr.B.R. Ambedkar Veedhi, Bangalore - 01
3. PA to Vice — Chancellor/ PA to Registrar/Registrar (Eva.)/ Finance Officer, Rajiv Gandhi University Health Sciences, Bangalore
4. All Officers of the University Examination Branch/ Academic Section.
5. Guard File / Oifice copy.

ರಾಜೀವ್ ಗಾಂಧಿ ಆರೋಗ್ಯ ವಿಜ್ಞಾನಗಳ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕರ್ನಾಟಕ, ಬೆಂಗಳೂರು
Rajiv Gandhi University of Health Sciences, Karnataka, Bangalore
4th T Block, Jayanagar, Bangalore – 560 041

Ref:RGU/AUTH/AHS/OPTO/100/2021-2022 Date:08/11/2021

NOTIFICATION

Sub: Amendment to revised Ordinance Governing B.Sc Optometry Regulation & Curriculum 2019.

Ref: 1.Proceddings of BOS Meeting AHS PG held on 24/06/2021 & 20/07/2021
2. Proceeding of CAC held on 02/08/2021
3. Proceedings of 162nd Syndicate meeting held on 17/08/2021

****

In exercise of the power conferred under section 35(2) of RGUHS Act, 1994, the following amendment is incorporated in the RGUHS Notification, this amendment will come into force for exams conducted from the date of syndicate decision in this matter i.e 17/08/2021.

01.	For a pass in theory, a candidate shall secure not less than 50% for a pass in practical/clinical examination not less than 50% marks in university examination.	IA marks shall be added to the theory marks for 50% pass criteria for B.Sc Optometry RS4 scheme.

REGISTRAR

To,

The Principals of all affiliated Allied Health Sciences Institutions of RGUHS.

Copy to:

1. PA to Vice-Chancellor/PA to Registrar/Registrar(Eva)/ Finance officer RGUHS, Bangalore
2. Deputy Registrar, Admission/Affiliation/Examination, RGUHS, Bangalore
3. Public information officer RGUHS, Bangalore
4. The home page of RGUHS
5. Guard File/office copy

REVISED ORDINANCE GOVERNING REGULATIONS & CURRICULUM OF BACHELOR OF SCIENCE IN OPTOMETRY-2019

1. ELIGIBILITY FOR ADMISSION

A candidate desiring to join the four years programme leading to the B.Sc. Optometry degree

a. should have passed the Two year Pre University examination conducted by Department of Pre University Education, Karnataka State with English as one of the subjects and Physics, Chemistry , Biology / Maths as optional subjects. The candidate shall have passed the subjects of English, Physics, Chemistry, Biology / Maths individually also.

OR

b. Shall have passed any other examination conducted by Boards/Councils/Intermediate examination established by State Governments/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, Biology / Maths individually also.

c. Shall have passed Intermediate examination in Science of an Indian University/Board/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, Biology / Maths individually also.

d. Shall have passed first year of the three year degree course of a recognized University with Physics, Chemistry and Biology including a practical test in these subjects provided the examination is an 'University Examination' provided that the candidate shall have passed subjects of English, Physics, Chemistry, Biology / Maths individually in the pre university or other examinations mentioned in the clauses above.

e. Shall have passed B.Sc. Examination of an Indian University, provided that he/she has passed the B.Sc. examination with not less than two of the following subjects : Physics, Chemistry, Biology (Botany, Zoology) provided the candidate has passed subjects of English, Physics, Chemistry Biology / Maths individually in the qualifying examinations mentioned in clauses a, b and c.

f. Candidates with two years diploma from a recognized Government Board in Optometry shall have passed class 12 [10+2] with Physics, Chemistry and Biology, as subjects or candidates

with 3 years diploma from a recognized Government Board in Optometry should have studied Physics, Biology and Chemistry as subjects during the tenure of the course.

Lateral entry to second year of B.Sc.Optometry for candidates who have passed diploma program from the Government Boards and recognized by RGUHS, fulfilling the conditions specified above under Sl. No. 5 and these students are eligible to take admission on lateral entry system only in the same subject studied at diploma level from the academic year 2008-09 vide RGUHS Notification no. AUTH/AHS/317/2008-09 dated: 01.08.2008

Note:

a. The candidate shall have passed individually in each of the subjects.

b. Candidates who have completed diploma or vocational course through Correspondence shall not be eligible for any of the courses mentioned above

1.2 AGE: A candidate should have completed the age of 17 years as on 31st December of the year of admission.

1.3 SELECTION

Selection of the candidates should be based on the merit in the entrance examination held by the University or competent authority.

2. DURATION OF THE COURSE

The student shall undergo a period of certified study extending over 4 academic years including one year internship. Project exams at end of 4th year.

3. MEDIUM OF INSTRUCTION:

The medium of instruction and examination shall be in English.

4. SCHEME OF EXAMINATION:

There shall be three examinations one each at the end of 1st, 2nd , 3rd year and project and exit examination at the end of the 4th year.

5. ATTENDANCE

Every candidate should have attendance not less than 80% of the total classes conducted in theory and practical's separately in each calendar year calculated from the date of commencement of the term to the last working day as notified by the University in each of the subjects prescribed to be

eligible to appear for the university examination. A candidate pursuing the course shall study in the college for the entire period as a full time student. No candidate should join any other course of study or appear for any other examination conducted by this university or any other university in India or abroad during the period of registration.

A candidate lacking in the prescribed attendance should not be permitted to appear for the examination in that subject(s)

6. INTERNAL ASSESSMENT (IA):

1st Year B.Sc. Optometry
Theory - 20 marks

2nd & 3rd year B.Sc. Optometry
Theory – 20 Marks

There shall be a minimum of two periodical tests preferably one in each term in theory and practical of each subject in an academic year. The average marks of the two tests will be calculated and reduced to 20. The marks of IA shall be communicated to the University at least 15 days before the commencement of the University examination. The University shall have access to the records of such periodical tests. The marks of the internal assessment must be displayed on the notice board of the respective colleges with in a fortnight from the date that the test is held. If a candidate is absent for any one of the tests due to genuine and satisfactory reasons, such a candidate may be given a re-test within a fortnight.

8. TEACHING HOURS

The number of hours of teaching theory and practical, subject wise in first year, second year and third year are shown in Table-I, Table-II and Table-III

Table - I Distribution of Teaching Hours in First Year Subjects

Subject	Method / Number of Hours	
	Theory	Practicals
General Anatomy & General physiology	90	40
Basic Biochemistry & Nutrition	70	30
Ocular Anatomy ,ocular Physiology& biochemistry	90	40
Physical & Geometric Optics & principles of lighting	180	70
Computer Basics	20	20
Computer Programming	20	20
Functional English& Communications	30	-
Mathematics	30	-
Kannada	20	
Basic Accountancy	20	

Table - II Distribution of Teaching Hours in Second Year Subjects

Subject	Method / Number of Hours	
	Theory	Practicals
Optometric Optics & Dispensing optometry	120	100
Clinical Examination Of Visual System & Optometric Instruments	120	100
Visual optics	90	60
Pharmacology, Microbiology & Pathology	60	40
Clinical Psychology	20	-
Hospital Procedure & Public Relations	25	-
Clinics	-	270

Table - III Distribution of Teaching Hours in Third Year Subjects

Main Subject	Method / Number of Hours	
	Theory	Practicals
Contact Lenses	60	60
Systemic & Ocular diseases	90	70
Low Vision Aids & Geriatric Optometry	30	30
Practice management, Law and optometry & occupational optometry	40	20
,Research Methodology& Biostatistics	50	-
Pediatric Optometry, Advances In Optometry & Binocular Vision	90	80
Public Health, Epidemiology	20	-
Clinics & Special Clinics	-	270

Table - IV Distribution of Teaching Hours in Fourth Year Subjects

Project	-	1 year
CLINICAL POSTING & SPECIALITY POSTING		

9. Schedule of Examination:

The university shall conduct two examinations annually at an interval of not less than 4 to 6 months as notified by the university from time to time. A candidate who satisfies the requirement of attendance, progress and conduct as stipulated by the university shall be eligible to appear for the university examination. Certificate to that effect shall be produced from the Head of the institution along with the application for examination and the prescribed fee.

10. Scheme of Examination

There shall be four examinations, one each at the end of I, II, III & IV year. Marks for First Year, second year, Third year and fourth year University theory and practical Examinations are shown in the Table below .

First year Examination:

The University examination for 1st year shall consist of Written Examination & Practical.

Second & Third year examination:

The University examination for 2nd and 3rd year shall consist of Written Examination & Practical.

Fourth Year EXAMINATION:

The project assessment & Exit practical examination

Written Examinations consists of

- 04 papers in the 1st year
- 04 papers in the 2nd Year
- 06 papers in the 3rd Year.

Practical examination:

- Practical examinations, at the end 1st Year.
- Practical examinations, at the end 2nd Year.
- Practical examinations at the end of the 3rd year.

Practical examinations at the end of the 4th year.

University Examination – Subjects and Distribution of Marks

Non- University Examination: These are internal examination subject for which no university assessment would be made.

Bachelors in Optometry University Examination – Subjects and Distribution of Marks

10.1 FIRST Year Examination

Subject	University Examination				Total
	Theory	Internal	Practicals	Viva Voce	
Basic Biochemistry & Nutrition	100	20	-	-	**120**
General Anatomy(sec A) General physiology(sec B)	50 50	10 10			**120**
Ocular Anatomy , ocular Physiology & Ocular biochemistry	100	20	-	-	**120**
Physical & Principles of Lighting (sec A) Geometric Optics (sec B)	50 50	10 10	80	20	**220**
Non- University Examination (SUBSIDIARY)					
Subject	Theory	Internal			**Total**
Computer programming**	80	20			**100**
English**	80	20			**100**
Mathematics**	80	20			**100**
Basic Accounts**	80	20			**100**
Computer Basics**	80	20			**100**

Note: I A = Internal Assessment
*Main Subjects shall have University Examination. There shall be one subject University Practical Examination.
**Subsidiary subjects: Examination for subsidiary subjects shall be conducted by respectivecolleges

Mark Distribution

1. **Basic Biochemistry & Nutrition**

2. Long essay 2Questions (second question choice) 2x10= 20 marks
3. Short essay 10Questions (Questions no 5 &10 choice) 10x5= 50 marks
4. Short answer 10 Questions (Questions no 15 &20 choice) 10x3= 30 marks

Total= 100

2. General Anatomy (sec A)

1. Long essay 1 Questions (Questions no 1choice) 1x10= 10 marks
2. Short essay 5 Questions(Questions no 5 choice) 5x 5= 25 marks
3. Short answer 5Questions (Questions no 10 choice) 5x3= 15marks

Total= 50

3. General physiology (sec B)

1. Long essay 1 Questions (Questions no 1choice) 1x10= 10 marks
2. Short essay 5 Questions(Questions no 5 choice) 5x 5= 25 marks
3. Short answer 5Questions (Questions no 10 choice) 5x3= 15marks

Total= 50

4. Ocular l Anatomy , ocular Physiology & Ocular biochemistry

1. Long essay 2Questions (second question choice) 2x10= 20 marks
2. Short essay 10Questions (Questions no 5 &10 choice) 10x5= 50 marks
3. Short answer 10 Questions (Questions no 15 &20 choice) 10x3= 30 marks

Total= 100

5. Physical & Principles of Lighting (sec A)

1. Long essay 1 Questions (Questions no 1choice) 1x10= 10 marks
2. Short essay 5 Questions(Questions no 5 choice) 5x 5= 25 marks
3. Short answer5 Questions (Questions no 10 choice) 5x3= 15marks

Total= 50

6. Geometric Optics (sec B)

1. Long essay 1 Questions (Questions no 1choice) 1x10= 10 marks
2. Short essay5 Questions(Questions no 5 choice) 5x 5= 25 marks
3. Short answer5 Questions (Questions no 10 choice) 5x3= 15marks

Total= 50

10.2 SECOND Year Examination

Subject	**University Examination**				**Total**
	Theory	Internal	Practicals	Viva Voce	
Optometric Optics & Dispensing Optometry	100	20	-	-	**120**
Visual Optics	100	20	-	-	**120**
CEVS & Optometric instruments	100	20	-	-	**120**
Microbiology, Pathology(sec A) Pharmacology(sec B)	50 50	10 10	-	-	**120**
Clinical practical examination	**-**		80	20	**100**
Non- University Examination (SUBSIDIARY SUBJECTS)					
Subject	Theory		Internal		**Total**
Medical Psychology**	80		20		**100**
Hospital Procedure & Public relations**	80		20		**100**

Subsidiary subjects: Examination for subsidiary subjects shall be conducted by respective colleges

Mark Distribution

1 .Optometric Optics

1. Long essay 2Questions (second question choice) — 2x10=20marks
2. Short essay10Questions (Questions no 5 &10 choice) — 10x5= 50marks
3. Short answer10 Questions (no choice) — 10x3= 30 marks

Total=100

2. Visual Optics

1. Long essay 2Questions (second question choice) — 2x10= 20 marks
2. Short essay 10Questions (Questions no 5 &10 choice) — 10x5= 50 marks
3. Short answer 10 Questions (no choice) — 10x3= 30 marks

Total= 100

3. CEVS & Optometric instruments

1. Long essay 2Questions (second question choice) — 2x10= 20 marks
2. Short essay 10Questions (Questions no 5 &10 choice) — 10x5= 50 marks
3. Short answer 10 Questions (no choice) — 10x3= 30 marks

Total= 100

4. Microbiology, Pathology (sec A)

1. Long essay 1 Questions (Questions no 1choice) — 1x10= 10 marks
2. Short essay 5 Questions(Questions no 5 choice) — 5x 5= 25 marks
3. Short answer5 Questions (no choice) — 5x3= 15marks

Total= 50

Pharmacology (sec B)

1. Long essay 1 Questions (Questions no 1choice) — 1x10= 10 marks
2. Short essay 5 Questions(Questions no 5 choice) — 5x 5= 25 marks
3. Short answer5 Questions (no choice) — 5x3= 15marks

Total= 50

10.3 THIRD Year Examination

Subject	University Examination				Total
	Theory	Internal	Practical	Viva Voce	
Low Vision Aids & Geriatric Optometry	100	20	-	-	**120**
Contact Lens	100	20	-	-	**120**
Research Methodology & Statistics	100	20			**120**
Systemic diseases (sec A) Ocular Diseases (sec B)	50 50	10 10	-	-	**120**
Practice Management & Law and optometry (sec A) Occupational Optometry (sec B)	50 50	10 10	-	-	**120**
Pediatric Optometry, Binocular vision & Advances in Optometry	100	20	-	-	**120**
Clinics & Specialties	**-**		160	40	**200**

Non- University Examination Subsidiary Subjects)				
Subject	Theory	Internal		**Total**
Public health, Epidemiology**	80	20		**100**

**Subsidiary subjects: Examination for subsidiary subjects shall be conducted by respective colleges

Mark Distribution

1. Low Vision Aids & Geriatric Optometry

1. Long essay 2 Questions (second question choice) 2x10= 20 marks
2. Short essay 10 Questions (Questions no 5 &10 choice) 10x5= 50 marks
3. Short answer 10 Questions (no choice) 10x3= 30 marks

Total= 100

2. Contact Lens

1. Long essay 2 Questions (second question choice) 2x10= 20 marks
2. Short essay 10 Questions (Questions no 5 &10 choice) 10x5= 50 marks
3. Short answer 10 Questions (no choice) 10x3= 30 marks

Total= 100

3. Research Methodology & Statistics

1. Long essay 2 Questions (second question choice) 2x10= 20 marks
2. Short essay 10 Questions (Questions no 5 &10 choice) 10x5= 50 marks
3. Short answer 10 Questions (no choice) 10x3= 30 marks

Total= 100

4. Systemic diseases (sec A)

1. Long essay 1 Questions (Questions no 1choice) 1x10= 10 marks
2. Short essay 5 Questions(Questions no 5 choice) 5x 5= 25 marks
3. Short answer 5 Questions (no choice) 5x3= 15marks

Total= 50

5. Ocular Diseases (sec B)

1. Long essay 1 Questions (Questions no 1choice) 1x10= 10 marks
2. Short essay 5 Questions (Questions no 5 choice) 5x 5= 25 marks
3. Short answer 5 Questions (no choice) 5x3= 15marks

Total= 50

6. Practice Management & law in optometry (sec A)

1. Long essay 1 Questions (Questions no 1choice) 1x10= 10 marks
2. Short essay 5 Questions (Questions no 5 choice) 5x 5= 25 marks
3. Short answer 5 Questions (no choice) 5x3= 15marks

Total= 50

7. Occupational Optometry (sec B)

1. Long essay 1 Questions (Questions no 1choice) 1x10= 10 marks
2. Short essay 5 Questions (Questions no 5 choice) 5x 5= 25 marks
3. Short answer 5 Questions (no choice) 5x3= 15marks

Total= 50

8. Pediatric Optometry, Binocular vision & Advances in Optometry

1.	Long essay 2 Questions (second question choice)	2x10= 20 marks
2.	Short essay 10 Questions (Questions no 5 &10 choice)	10x5= 50 marks
3.	Short answer 10 Questions (no choice)	10x3= 30 marks
		Total= 100

FOURTH year

Subject	University Examination				Total
	Theory	Internal	Practical	Viva Voce	
Project			80	20	100
Clinical Examination- **"EXIT EXAMINATION'**			160	40	200

11. Criteria for pass

12.1. First year examination

a. Main Subjects: A candidate is declared to have passed in a subject, if he/she secures, 50% of marks in University Theory exam and internal assessment added together.

b. Subsidiary Subjects: The minimum prescribed marks for a pass in subsidiary subject shall be 35% of the maximum marks prescribed for a subject. The marks obtained in the subsidiary subjects shall be communicated to the University before the Commencement of the University examination.

12.2. Second and Third year Examination

a. Main Subjects: A candidate is declared to have passed the examination in a subject if he/she secures 50% of the marks in Theory and 50% in practical separately. For a pass in theory, a candidate has to secure a minimum of 40% marks in the University conducted written examination, and 50% in aggregate in the University conducted written examination and internal assessment added together and for pass in Practical, a candidate has to secure a minimum of 40% marks in the university conducted Practical/Clinical examination and 50% in aggregate i.e. University conducted Practical/Clinical and Internal Assessment.

b. Subsidiary Subjects: The minimum prescribed marks for a pass in subsidiary subject shall be 35% of the maximum marks prescribed for a subject. The marks obtained in the subsidiary subjects shall be communicated to the University before the commencement of the University examination.

12. Carry over benefit

13.1 First year examination:

A candidate who fails in any one of the four main subjects of first year shall be permitted to carry over that subject to second year. However, he/she must pass the carry over subject before appearing for second year examination.

13.2 Second year examination.

A candidate is permitted to carry over any one main subject to the third year but shall pass this subject before appearing for the third year examination.

13.3 Third year examination.

A candidate shall pass all the subjects of the third year examinations to be eligible for internship.

13. Declaration of Class

a. A candidate having appeared in all subjects in the same examination and passed that examination in the first attempt and secures 75% of marks or more of grand total marks prescribed will be declared to have passed the examination with distinction.
b. A candidate having appeared in all subjects in the same examination and passed that examination in the first attempt and secures 65% of marks or more but less than 75% of grand total marks prescribed will be declared to have passed the examination in First Class.
c. A candidate having appeared in all subjects in the same examination and passed that examination in the first attempt and secures 50% of marks or more but less than 65% of grand total marks prescribed will be declared to have passed the examination in Second Class.
d. A candidate passing a university examination in more than one attempt shall be placed in Pass class irrespective of the percentage of marks secured by him/her in the examination.

The marks obtained by a candidate in the subsidiary subjects shall not be considered for award of Class or Rank. [Please note, fraction of marks should not be rounded off clauses (a), (b) and (c)

14. Eligibility for the award of Degree:

A candidate shall have passed in all the subjects of first, second and third year to be eligible for a compulsory 12 months of rotational internship. On completion of 12 months of the internship with pass criteria in outgoing clinical assessment exams (EXIT EXAMS) the candidate is then eligible for the award of degree.

INTERNSHIP

COMPULSORY ROTATORY INTERNSHIP FOR B.Sc. OPTOMETRY

Twelve-month compulsory rotational postings during which students have to work in the following areas:

1. General Optometry department and General Ophthalmology department – 1 month
2. Speciality refraction with Retina and Cornea Ophthalmology department– 1 month
3. Paediatric refraction with Paediatric ophthalmology – 1 month
4. LASIK investigation – 1 month
5. Cataract investigation – 1 month
6. HFA and Glaucoma ophthalmology department – 1 month
7. Contact lens – 1 month
8. Low vision and Rehabilitation department – 1 month
9. Vision therapy – 1 month
10. Ocularistry and Electrodiagnostics – 1 month
11. Opticals – 1month
12. Community Refraction – 1month

Students must be able to assist independently the following procedures at the end of their internship postings;-

1. General Optometry department, Community refraction and General Ophthalmology department:

Students should get well versed in handling refraction cases like

- General Refraction
- Aphakia
- Emergency cases like redness/trauma
- Refract all kinds of refractive error

- Refract ectatic conditions of cornea
- Post-Operative refraction
- Follow up cases of any infection – Chalazion/Stye/Conjunctivitis
- Differential diagnosis and diagnosis of anterior chamber infections
- Troubleshoot
- Appropriate referral

2. Speciality refraction with Retina and Cornea Ophthalmology department
   - Complete speciality refraction work-up
   - Differential diagnosis and diagnosis of retinal conditions
   - Differential diagnosis and diagnosis of corneal conditions
   - Refraction for all post-operative retinal and corneal conditions
   - To know the management for retinal and corneal condition
   - To understand and decide the prognosis of every condition
   - Appropriate referral

3. Paediatric refraction with Paediatric ophthalmology
   - Complete paediatric work-up
   - All syndromes
   - Aphakia
   - Hereditary conditions
   - Pedigree charting
   - Cycloplegic refraction
   - Decide about prescription for paediatric age groups

4. LASIK investigation and Cataract investigation
   - Appropriate history taking
   - Able to perform the investigation using appropriate diagnostic tool
   - Able to interpret the reports post investigation
   - To decide if the patient can undergo LASIK or cataract surgery

5. HFA and Glaucoma ophthalmology department
   - Able to perform the HFA for all kinds of patients with any HFA strategy
   - Able to interpret the HFA reports and understand the prognosis of Glaucoma
   - To diagnose the type of Glaucoma
   - To know the management of all types of Glaucoma
   - Appropriate referral

6. Contact lens
   - Soft lens/Soft toric
   - RGP CL
   - ROSE K
   - Miniscleral CL
   - Cosmetic CL
   - Bandage CL

- Troubleshoot
- Steven Johnson's syndrome
- Sjogren syndrome
- Aphakia
- Post-surgery
- High astigmatism – Keratoconus/PMD
- Patient care and maintenance

7. Low vision and Rehabilitation
   - Complete low vision work-up
   - Distance and Near magnification trial
   - Prescribe appropriate devices according to the condition
   - Appropriate referral
   - To understand and know to rehabilitate a low vision patient according to their needs

8. Vision therapy
   - Complete Binocular vision work up
   - To diagnose every condition appropriately
   - To decide about the appropriate therapy for every condition
   - Diplopia charting and Hess charting
   - DMR and Prism trial for diplopia
   - Perceptual skill assessment
   - To work on defective perceptual skill appropriately

9. Ocularistry and Electrodiagnostics
   - Orbital diseases
   - Evisceration, Enucleation and Exenteration
   - Fitting and Removal of customised eye – Fitting assessment
   - Materials used
   - Processing and Fabrication techniques
   - Patient care and hygiene

10. Opticals
    - To decide and choose the appropriate spectacle lens and frame according to the power
    - Ocular measurements
    - Lens coatings
    - Frame fitting and adjustments
    - Dispensing

NOTE: AT THE END OF INTERNSHIP THERE WILL BE A PRACTICAL EXAM.

(EXIT EXAM)

FIRST YEAR B.Sc. OPTOMETRY SYLLABUS

- Physical Optics & principle of lighting (Sec A) Geometric Optics (Sec B)
- General Anatomy (Sec A) &Physiology (Sec B)
- Ocular Anatomy, Physiology & Ocular biochemistry
- General Biochemistry& Nutrition

PHYSICAL OPTICS (THEORY)

SL NO	TOPICS	HOURS
1	Nature of light: An overview Corpuscular Theory, Wave Theory, quantum theory and dual nature	02
	Simple Harmonic Motion Definition, Mathematical representation, energy in SHM, combination of two SHMs (along a line and at right angles). Waves : Transverse and Longitudinal, mathematical representation of a wave, wave fronts, path difference and phase difference, coherent waves, Numerical.	10
	Interference of light Theory of interference-Conditions for interference, Young's double slit experiment, Expression for fringe width, Intensity distribution of the double slit interference pattern, condition for good contrast.	10
	Interference in thin films: Reflection phase shifts, optical path length. Interference in thin parallel films of uniform thickness, variable thickness (air wedge, Newton's rings), their applications to antireflection coatings, optical flatness of reflecting surfaces, determination of : wavelength, refractive index, thickness of thin films, radius of curvature, Michelson interferometer, Numerical	10
2	Diffraction – Introduction, Fresnel and Fraunhofer diffraction. Fresnel diffraction: Rectilinear propagation of light, Zone plate, Theory of Fresnel's half period zone. Numerical. Fraunhofer Diffraction: Diffraction pattern from single slit, Double slit. Diffraction pattern due to N Slits-Theory of plane transmission grating. Resolving power of the diffraction grating. Numerical.	
3	Polarization – Review of light as a transverse wave. Polarization phenomenon due to reflection, refraction and scattering Brewster's and Malus' laws. Polaroids. Double refraction, retardation plates, Nicol prism as a device to produce polarized light, dichroism, equation to polarization ellipse, elliptical, circular and linear polarizations, their production and detection Optical activity, Lorentz half shade polarimeter, determination of specific rotation	10
4	Absorption and scattering: General and selective absorption, Distinction between absorption and scattering, absorption by solids, liquids and gases, scattering: Rayleigh, Mie and Raman scattering.	08

5	Radiometry and Photometry – Electromagnetic spectrum, Radiometry, Photometry, sources	
	of optical radiation and detectors of radiation.	06
6	Laser basics: Introduction, Einstein quantum theory of radiation, Essentials of a laser, Ruby laser, Holography, Numerical.	08
7	Fiber Optics: Structure, Optics of propagation, Attenuation, Distortion, Numerical.	6
8	The particle nature of radiation: Photoelectric effect, Crompton effect (no derivation of Compton shift equation), Numerical	6
	TOTAL	**86**

PHYSICAL OPTICS - PRACTICAL

Any 10 of the following experiments

SL NO	TOPICS	HOURS
1	EXPERIMENTS 1. Air wedge 2. Newton's rings 3. Biprism 4. Michelson's interferometer 5. Refractive index of a liquid using a hollow prism 6. Refractive indices of an anisotropic crystal 7. Variation of refractive index with wavelength 8. Diffraction grating – minimum deviation/normal incidence method 9. Resolving power of a telescope 10. Polarimeter 11. Photo diode characteristics 12. Ultrasonic interferometer 13. Numerical aperture of optical fibres 14. Wave length of a laser light using grating. 15. Photoelectric effect. **16.** Planck's constant	35
		35

RECOMMENDED BOOKS

1. Fundamentals of Optics – 4th edition – Francis.A.Jenskins and Harvey.E.White.
2. A textbook of Optics – N.Subrahmanyam and Brij Lal.
3. Introduction to optics – Frank.L.Pedrotti and Leno.S.Pedrotti.
4. Physics for scientists and Engineers with modern Physics, Vol 2, 6th Edition, Serway and Jewett

GEOMETRICAL OPTICS – THEORY

SL NO	TOPICS	HOURS
1	Properties of light: Classification of optics based on the nature and properties of light. The rectilinear propagation of light, Umbra and Penumbra, Speed of light in vacuum and in a stationary media, Beam, pencil and ray of light, Laws of reflection and refraction, Refractive index, Optical path, Graphical construction for refraction, Principle of reversibility, Fermat's principle (only qualitative discussion), Colordispersion. Numerical	8
2	Plane surfaces and Prisms: Parallel beam, the critical angle and total reflection, Plane parallel plate, Refraction by a prism, Minimum deviation, Thin prisms, Graphical method of ray tracing, Direct vision prisms, Reflection of divergent rays, Refraction of divergent rays, Images formed by paraxial rays. ophthalmic prisms. Numerical.	08
3	Spherical surfaces: Introduction, Focal points and focal lengths, Image formation, Virtual images, conjugate points and planes, Convention of signs, Graphical constructions (parallel ray method only), Magnification, Vergence and reduced vergence, Gaussian formula. Numerical.	08
4	Spherical mirrors – focal points, focal lengths, image formation, mirrors and vergence, reflection matrix, aspheric mirrors	02
5	Thin lenses: Lenses, Focal points and focal lengths, Imageformation: graphical method (parallel ray and oblique ray methods) and derivation of lens formula,conjugate points and planes. Lateral magnification,Virtual images, Lens makers' formula,Power of a thin lens, Thin lenses in contact, without contact. Numerical.	06
6	Thick lenses: Imageformation: graphical method (both parallel ray and oblique ray methods), Focal points, principal points, nodal points and optical center, thick lens formulas (no derivation). Numerical	08
7	Matrix methods in paraxial optics: Introduction, Translation matrix, Refraction matrix, Reflection matrix and Thick lens and thin lens matrices. Numerical.	08
8	Aberration theory :Spherical (coma, astigmatism, curvature of field and distortion) and chromatic aberrations and their minimization including GRIN systems(qualitative description only).	08
9	Optics of the Eye: Biological structure of the eye, Optical representation of the eye, Functions of the eye, Errors of refraction and their correction, Laser therapy for ocular defects. Depth of focus	08
10	Aperture and stops :Field stop and Aperture stop, Entrance and exit pupils, chief ray, Front stop, stop between two lenses, two lenses with no stop, field of view	06
11	Optical Instruments – The Camera, eye and its refractive anomalies, simple magnifier, compound microscope and telescopes. 4 Hours	08
		78

GEOMETRIC OPTICS – PRACTICALS

Practical: 3 Hours/week
Any 10 of the following experiments

SL NO	TOPICS	HOURS
1	1. Law of reflection 2. Law of refraction 3. Critical angle of glass 4. Angle of minimum deviation using I-d curve 5. f &μ of convex lens 6. f &μ of concave lens 7. f of convex mirror 8. f of concave mirror 9. μ of solid 10. μ of liquid 11. Angle of the prism – using spectrometer 12. Determination of Cauchy's constant 13. μ of the material of the crown and flint glasses for Na light 14. Dispersive power of a prism 15. Verification of inverse square law of radiation using a photometer 16. Photometer - determination of transmission coefficient	45
		45Hrs

PRINCIPLES OF LIGHTING:

SL NO	TOPICS	HOURS
1	Visual tasks: factors affecting visual tasks	**2**
2	Modern theory on light &colour: synthesis of light	**2**
3	Additive & subtractive synthesis of colour	**2**
4	Light sources: Modern light sources – spectral energy distribution – luminous efficiency – colour temperature – colour rendering]	**2**
5	Illumination: Luminous flux, candela, solid angle, illumination, utilization factor, depreciation factors, illumination laws	**2**

6	Lighting installation: glare, luminaries, lighting fixtures, types of lighting	**2**
7	Photometry: measurement of illumination, photometers and filters	**2**
8	Eye care and lighting – special care with VDU.	**2**
		16

RECOMMENDED BOOKS

1. Fundamentals of Optics – 4th edition – Francis.A.Jenskins and Harvey.E.White.
2. A textbook of Optics – N.Subrahmanyam and Brij Lal.
3. Introduction to optics – Frank.L.Pedrotti and Leno.S.Pedrotti.
4. Physics for scientists and Engineers with modern Physics, Vol 2, 6th Edition, Serway and Jewett
5. Introductory lighting (Illuminating engineering society of North America)
6. Environmental vision (Pitts)

GENERAL ANATOMY

SL NO	TOPICS	HOURS
1	Introduction- Anatomy and it's sub-division, planes of the body, terms in relation of structures, Regional Anatomy, organ system, osteology of orbital bones	45
2	Tissues of the body [Histology of the body tissues] 2.1 Epithelium 2.2 Connective tissue 2.3 Bone and cartilage 2.4 Muscles: Skeletal, smooth, cardiac 2.5 Blood vessels 2.6 Neuron, Neuroglia 2.7 Glands, exocrine and endocrine, lacrimal gland in detail 2.8 Skin and appendages 2.9 Lymphoid Tissues 2.10 Ganglian	
3	Organ systems: [General plan] 3.1 Locomotor system: Bones, muscles, joints 3.2 Cardiovascular systems: Heart, Regional blood vessels- arteries, veins 3.3 Lymphatic system including immune system 3.4. Digestive system 3.5. Respiratory system 3.6. Reproductory system 3.7. Endocrine system 3.8. Central nervous system- spinal and brain stem, cerebellum, cerebrum, spinal, cranial Nerves 3.9 ganglia	

RECOMMENDED BOOKS

1. Human anatomy	B.D.Chourasia
2. Text book of human anatomy	H.Gray
3. Anatomy and Physiology of the eye	A.K.Khurana, Indu Khurana
4. Clinical anatomy of the eye	S.Snell, A.Lemp
5.Text book of Anatomy	Vishramsingh

GENERAL PHYSIOLOGY

SL NO	TOPICS	HOURS
1	1.1. Cell structure and organization 1.2 Gene action 1.3. Tissue organization – Epithelium 1.1. Connective tissue - Collagen fibers- elastic fibers- areolar fibers- cartilage- bone 1.5. Contractile tissue- striated – skeletal –cardiac- non striated –plain myoepithelial 1.6. General principles of cell physiology 1.7. Electrophysiology of cells 1.8.Physiology of skeletal muscles	
2	Blood 2.1 Composition 2.2 Volume measurement and variations 2.3 Plasma proteins- classification and functions 2.4 RBC's- development, morphology and measurement- functions and dysfunctions 2.5 WBC's- development – classifications - morphology–functions and dysfunctions 2.6. Platelets –morphology-development, functions and dysfunctions 2.7 Clotting- factors- mechanism- anticoagulants- dysfunctions 2.8. Blood grouping –classifications- importance in transfusion, Rh factor & incompatibility 2.9. Suspension stability 2.10. Osmotic fragility 2.11. Reticuloendothelial system Spleen – lymphatic tissue Thymus - Bone marrow Immune system - cellular - humoral- autoimmune	
3	Digestion 3.1. General arrangement 3.2. Salivary digestion – functions and regulations 3.3. Gastric digestion –functions and regulations 3.4. Pancreatic digestion- functions and regulations 3.5. Intestinal digestion – functions and regulations 3.6. Liver and Bile 3.7. Absorption 3.8. Motility-Deglutition-Gastric-Intestinal-Vomiting-Defecation 3.9. Functions of large intestine 3.10. Neurohumoral regulations of alimentary functions, summary	45
4	Excretion 4.1. Body fluids – distribution, measurement and exchange 4.2. Kidney –structure of nephron – mechanism of urine formation-composition of urine and abnormal constituents- urinary bladder and micturition	

5	Endocrine system 5.1. Hormone mechanism – negative feedbacks- tropic action –Permissive action – cellular actions 5.2. Hypothalamic regulation 5.3. Hormones, Actions & Regulations of ✓ Hypophysis ✓ Thyroid ✓ Adrenal Cortex & medulla ✓ Parathyroid ✓ Islets of pancreas ✓ Miscellaneous 5.4. Common clinical disorders	
6	Reproduction 6.1. Male reproductive system- control and regulation-semen analysis 6.2. Female Reproductive system- Uterus -ovaries- menstrual cycle- Regulation -Pregnancy and delivery-breast – family planning	

7	Respiration 7.1. Mechanics of respiration 7.2. pulmonary function tests 7.3. Transport of respiratory gases 7.4. neural and chemical regulation of respiration 7.5.hypoxia cyanosis- dyspnoea- asphyxia	
8	Circulation 8.1. Heart: myocardium- innervation- transmission of cardiac Impulse-Events during cardiac cycle-cardiac output 8.2. Peripheral circulation: Peripheral resistance- Arterial blood pressure measurements- factors regulating variation – capillary circulation-venous circulation 8.3. Special circulation: coronary – cerebral 4.4.miscellaneous	
9	Nervous system 9.1. Neuron – conduction of impulse – synapse – receptor 9.2. Sensory organization- pathways and perception. Reflexes 9.3. cerebral cortex – functions 9.4. Thalamus- basal ganglia – Cerebellum – Hypothalamus 9.5. Autonomic nervous system- motor control of movements, posture and equilibrium- conditioned reflex, Eye hand co-ordination. Sleep, consciousness, behavior , memory	
10	Environmental Physiology 10.1. Body temperature regulation [including skin physiology] 10.2. Exposure to low and high atmospheric pressure	
11	Special senses [elementary] 11.1. Olfaction- Taste- Hearing- vision	
		45

GENERAL PHYSIOLOGY - DEMONSTRATION

1	Microscope &Haemocytometer	
2	Blood 2.1. RBC count 2.2. Hb 2.3.WBC count 2.4. Differential count 2.5. Hct Demonstration 2.6.ESR 2.7. Blood group and Rh type 2.8.Bleeding time and clotting time	20
3	Digestion – Test salivary digestion	
4	Excretion 4.1. Examination of urine ✓ Specific Gravity ✓ Albumin ✓ Sugar ✓ Microscopic examination for cells and cyst	
5	Endocrinology & Reproduction 5.1. Dry experiments in the form of cases showing different endocrine Disorders	
6	Respiratory system 6.1. Clinical examination of respiratory system 6.2. Spirometry 6.3. Breath holding test 6.4.endurance test	
7	Cardiovascular system 7.1. Clinical examination of circulatory system ✓ Measurement of blood pressure and pulse rate ✓ Effect of exercise on blood pressure and pulse rate	
8	Central Nervous System 8.1. Sensory system 8.2. Motor system 8.3. Cranial system 8.4. Superficial and deep reflexes 8.5.Test for hearing	
		20

RECOMMENDED BOOKS

1. Text book if medical physiology	Guyton
2. Human physiology	AK Jain, Indu Khurana
3. Human physiology	Chatterjee
4. Adler's physiology of the eye	Robert.A.Moses, William.M.Hart.Jr
5. Text book ocular anatomy & physiology	AK Khurana

OCULAR PHYSIOLOGY

SL NO	TOPICS	HOURS
1	1. Protective mechanisms in the eye. 2. Precorneal tear film and lacrimation 3. Extrinsic ocular muscles, their action and control of their movements. 4. Coats of the eyeball 5. Corneal physiology – Hydration, Metabolism, Corneal wound healing, Transparency, Permeability 6. Aqueous humour - Production, Circulation, Drainage and Intra ocular pressure 7. Vitreous Humour 8. Iris – pupil reaction 9. Crystalline lens and accommodation – Presbyopia 10. Retina – Physiology of RPE, Scotopic & Photopic vision, neural signal, retinal synapses, Photo transduction, Information processing, Retinal metabolism 11. Vision- general aspects of sensation 12. Pigments of the eye and photo chemistry 13. The visual stimulus, refractive errors 14. Visual acuity and its principle of measurements 15. Visual perception- binocular vision, stereoscopic vision, optical illusion 16. Visual pathway, central & cerebral connections, lesions of pathways & effects 17. Colour vision, colour vision defects and diagnostic tests	30
		30

RECOMMENDED BOOKS

1. Text book if medical physiology	Guyton
2. Human physiology	Choudhary
3. Human physiology	Chatterjee
4. Adler's physiology of the eye	Robert.A.Moses, William.M.Hart.Jr

	OCULAR ANATOMY	
1	**1.1 Introduction to anatomical terminologies**– cross section of eyeball **1.2Ocular Adnexa** a. Eye Brows b. Eyelids – Structure, Facial spaces, Arterial supply, nerve supply, venous & lymphatic Drainage c. Conjunctiva – general arrangements, structure, glands, arteries, veins, caruncle, plica Semilunaries **1.3 Lacrimal System** – Lacrimal Gland, Drainage, Tear film **1.4 Extraocular Muscles** - anatomy, innervations, actions	
2	**Cornea**: layers, cellular structures, refractive properties	
3	**Coats of eye ball** Sclera (Episclera & Sclera) Choroid, Ciliary body, Iris Retina (Detailed anatomy, cellular structure, blood supply and nerve supply)	
4	**Aqueous, anterior chamber, Intraocular pressure, vitreous body**	
5	**Pupil & Pupillary pathway and its lesions**	
6	**Crystalline lens** – structure, suspension, accommodation	
7	**Orbit** Orbital margin, Walls of orbital cavity Orbital structure & Foramen Surface anatomy, Relations of bony orbit, Orbital Muscles	
8	**Cranial Nerves** 1.Optic nerve 2. Oculomotor nerve 3. Trochlear Nerve 4. Abducent nerve 5. Facial Nerve (Nuclei, course, relationship with brain, ocular contribution in detail)	
9	**Visual Pathway** – Definition, anatomy of visual pathway, visual reflexes, Lesions of visual Pathway	
10	**Ocular Embryology**	
11	Demonstration 3.1. Practical dissection of Bull's eye 3.2. Practical demonstration of orbital structures	Total 30 Hours

OCULAR BIOCHEMISTRY

SL NO	TOPICS	HOURS
1	Importance of ocular biochemistry in clinical optometric practice	30
2	Tear film ✓ Composition - Lipid layer - Aqueous layer - Mucoid layer - Tear Secretion Functions & dysfunction – Diagnostic tests – Tear substitutes – Recent development	
3	Cornea ✓ Biochemical composition of epithelium – bowman's layer-stroma- Descemet's layer-endothelium-functions- corneal metabolism –nutrient uptake- energy-transparency-barrier mechanism-pump action-irrigating solutions –aging and other anomalies-recent developments	
4	Lens ✓ Composition-metabolism-glucose utilization- sorbitol pathways- Glutathione and ascorbic acid transport- transparency- cataract formation- aging photo oxidation- sugar cataract- cataract and ascorbic acid – medical therapy- recent developments	
5	Aqueous humour ✓ Composition- function-Ciliary body-aqueous humour production-IOP- Glaucoma	
6	Vitreous humour ✓ Structure-composition functions- vitreous biochemical pathology- Intraocular gels-recent developments	
7	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-aminoacids- taurine- neuropeptides. Biochemical correlates of retinal diseases	
8	Free Radicals and Antioxidants Mechanism of Lipid Peroxidation- oxidative damage to the lens- vulnerability of the Retina to Free Radicals – Antioxidants in the Retina and RPE – Vitamin E – Ascorbate – Carotenoids	
		30

GENERAL BIOCHEMISTRY& NUTRITION

SL NO	TOPICS	HOURS
1	Carbohydrate Chemistry; Definition, general classification with examples, composition, sources, properties and functions of Monosaccharides, Disaccharides, Oligosaccharides and Polysaccharides. Glycosaminoglycans (mucopolysaccharides-in detail)	4
2	Lipid Chemistry ; Definition, general classification Definition, classification, and functions of Fatty acids, Cholesterol, Essential fatty acids , Phospholipids and their importance	3
3	Amino-acid Chemistry; Amino acid chemistry: Definition, Classification, Peptide bonds, Peptides: Definition, Biologically important peptides. Protein chemistry: Definition, Classification, Functions of proteins, Collagens, Plasma proteins, Muscle proteins	6
4	Enzymes; Definition, Active site, Cofactor (Coenzyme, Activator), Proenzyme. Classification with examples, Factors effecting enzyme activity, Mechanism of enzyme action. Diagnostic enzymology (clinical significance of enzymes)	5
5	Nucleotide and Nucleic Acid Chemistry; Nucleotide chemistry: Nucleotide composition, functions of free nucleotides in body. Nucleic acid (DNA and RNA) chemistry: Difference between DNA and RNA, Structure of DNA (Watson and Crick model), Functions of DNA. Structure and functions of tRNA, rRNA, mRNA.	3
6	Digestion and Absorption; General characteristics of digestion and absorption, Digestion and absorption of carbohydrates, proteins and lipids. Disorders of digestion and absorption – Lactose intolerance,	3
7	Fundamentals of Biological oxidative reactions-ATP formation.	3
8	Carbohydrate Metabolism; Introduction, Glycolysis – Aerobic, Anaerobic, Citric acid cycle, HMP Shunt pathway,	4
9	Lipid Metabolism; Introduction to lipid metabolism, Lipolysis, β-oxidation of fatty acids, Ketone body metabolism: Ketone body formation (ketogenesis), utilization (ketolysis), ketosis, Rothera's test. Cholesterol metabolism: degradation, cholesterol transport Hypercholesterolemia and its effects (atherosclerosis and coronary heart diseases) Hypocholesterolemic agents,	5
10	Amino acid and Protein Metabolism; Catabolism of amino acids - Introduction, transamination, deamination, Fate of ammonia, transport of ammonia, Urea cycle Specialized products formed from amino acids - from glycine, arginine, methionine, phenylalanine and tyrosine.	3
11	Vitamins ; Definition, classification according to solubility, Individual vitamins (Water soluble & fat soluble) - Sources, Coenzyme forms, functions, RDA, digestion, absorption and transport, deficiency and toxicity	8
12	Mineral Metabolism; Definition, Sources, RDA, Digestion, absorption, transport, excretion, functions, disorder of Individual minerals - Calcium, phosphate, iron, Magnesium, fluoride, selenium, molybdenum, copper. Phosphate, calcium and iron in detail	5
13	Cell Biology; Introduction, Cell structure, Cell membrane structure and function, various types of absorption. Intracellular organelles and their functions, briefly on cytoskeleton	2

14	Nutrition; Introduction, Importance of nutrition Calorific values, Respiratory quotient – Definition, and its significance Energy requirement of a person - Basal metabolic rate: Definition, Normal values, factor affecting BMR Special dynamic action of food Physical activities - Energy expenditure for various activities. Calculation of energy requirement of a person Balanced Diet Recommended dietary allowances Role of carbohydrates in diet: Digestible carbohydrates and dietary fibers Role of lipids in diet Role of proteins in diet: Quality of proteins - Biological value, net protein utilization, Nutritional	**8**
	aspects of proteins-essential and non-essential amino acids. Nitrogen balance Nutritional disorders	
15	Acid-Base balance; Acids, bases and buffers, pH. Buffer systems of the body, blood buffers, mechanism of buffer action. H+ and pH measurements.	**3**
16	Measles and associated eye disorders, low birth weight	**2**
17	Free radicals – Biological Reactions-Oxidants- antioxidants, -diseases –Therapeutic uses of Antioxidants	**3**
		70
GENERAL BIOCHEMISTRY – DEMONSTRATION		
1	1.Reaction of monosaccharides- disaccharides- qualitative 2.Estimation of Glucose 3.Estimation of proteins- ninhydrin reaction 4.Estimation of Vitamin C 5.Eatimation of Vitamin A	
		20

GENERAL BIOCHEMISTRY DEMONSTATION; -20 hours

1. Reactions of monosaccharide's-disaccharides- qualitative
2. Estimation of Glucose
3. Estimation of proteins- Ninhydrin
4. Estimation of Vitamin A
5. Estimation of Vitamin c

Total theory hours; 70
Practical- 20

Recommended Text books

1. Text book of Biochemistry Sathyanarayan
2. Text book of Biochemistry A.C Deb
3. Text book of Biochemistry S.K dasgupta
4. Biochemistry of the eye David. R. whilehart

FUNCTIONAL ENGLISH AND COMMUNICATION

SL NO	TOPICS	HOURS
1	Functional English -Grammar ✓ Components of a sentence – Verb -Transformation of sentences – Voice - Reportedspeech - Positive/ negative -Statement/ Interrogative - Subject verb agreement - Common errors – Exercises	
2	Vocabulary ✓ Synonyms and antonyms - Idioms and phrases – Similes -Words denoting assemblage	
3	Writing skills ✓ Note making – Summarizing - Report writing - Letter writing -Expansion of an idea – Comprehension	
	COMMUNICATION	
1	Introduction ✓ Communication process - Elements of communication - Barriers of communication and how to overcome them	
2	*Speaking* ✓ Importance of speaking efficiently - Voice culture - Preparation of speech - secrets of good delivery - Audience psychology handling - Presentation skills - Conference/Interview technique	30
3	*Listening* ✓ Importance of listening - Self-awareness about listening -Action plan execution -Barriers in listening - Good and persuasive listening	
4	*Reading* ✓ What is efficient and fast reading? - What is Awareness of existing reading habits -Tested techniques for improving speed - Improving concentration and comprehension through systematic study	
5	*Memory* ✓ What is memory, Brain- mind potential? - Systems for memorizing - Summary page - Building positive mental habits	
6	*Nonverbal Communication* ✓ Basics of nonverbal communication	
7	Self-awareness ✓ Self-image - Self talk – Relaxation - Personality development	
		30 Hrs

MATHEMATICS

SL NO	TOPICS	HOURS
1	Trigonometry 1.1. Measurements of angles- Definition of radian and its magnitude 1.2. Trigonometrical ratios- relations between them – simple problems - Signs of trigonometricratios- ratios of well-known angles - Applications of trigonometrical ratios to solving simple problems on refraction and reflection 1.3.Idea of allied angles – Formulae only for Sin [A+ B], Cos [A+B],Tan [A+B], Sin 2A, Cos 2A, Tan 2A in terms of products of trigonometrical ratios Sin A, Cos A, Tan A in terms of ratios of A/2- Problems	
2	Differential Calculus 2.1. Functions and Limits- $\lim_{x \to 0} \frac{\sin x}{x}$ 2.2. Differentiation – Algebraic and trigonometric functions –inverse trigonometric functions –successive differentiation- second order differentiation	30
3	Algebra 3.1 Revision of simple linear and quadratic equations 3.2 Theory of indices- Logarithms – common and Napierian Permutations, Combinations and binomial theorem	
4	Integral calculus 4.1 Integration of algebraic and trigonometric functions 4.2 Integration by substitution and by parts – Definite Integrals	
5	Geometrical application of integration 5.1 Simple concepts of area , volume , length of arc and surface of revolution	
6	Matrices 6.1.Determinants - matrix algebra	
7	Vectors 7.1Simple concepts – scalars, vectors , dot and cross product	
		30 Hrs

BASIC ACCOUNTANCY

SL NO	TOPICS	HOURS
	1. Introduction - Terms used in accounts - Principles of accountancy 2. Journal and journalizing 3. Ledger and ledger posting 4. Trial balance ✓ Subsidiary books ✓ Cash book ✓ Petty cash book ✓ Sales register ✓ Purchase register 5. Bank reconciliation 6. Depreciation and other adjustments 7. Balance sheet and profit and loss account statements Preparation of final accounts 8. Income tax and Sales tax [General ideas only]	20
		20

COMPUTER BASICS

SL NO	TOPICS	HOURS
1	Introduction to computers	30
2	Definition ✓ Input ✓ Output ✓ CPU	
3	Input output devices (types)	
4	Basis of computer system ✓ Switching computer on & off ✓ What is bias? ✓ Computer generations	
5	Keyboard practices	
6	Definitions of terms ✓ Desktop ✓ Software	
7	Computer systems: Hardware & software definitions	
8	Windows'98 ✓ Definition & Why ✓ Calculator - Word pad - Short cuts - Start menu - Media player - Note pad - Win amp – Paint - Control panel	
9	Microsoft word ✓ Opening, saving, deleting, typing, print , Page border, spelling, table, grammar, margin, Clip art, BIU, word art, Colour text &background, Picture drawing using word	
10	Excel ✓ Formulas - Design charts- Format tables	
11	PowerPoint ✓ Designing a presentation - Inserting some animation with sound	
12	Internet &its applications ✓ Interconnection to HTML ✓ E- mailing – Browsing – Chatting	

SECOND YEAR B.Sc. OPTOMETRY SYLLABUS

- Optometric Optics & Dispensing Optics
- Visual Optics
- Optometric Instruments & Clinical Examination of Visual System
- Pathology &Microbiology (Sec A) Pharmacology (Sec B)

OPTOMETRIC OPTICS (THEORY)

SL NO	TOPICS	HOURS
1	Introduction – Light, Mirror, Reflection, Refraction and Absorption	1
2	Prisms – Definition, properties, Refraction through prisms, Thickness difference, Base-apex notation, uses, nomenclature and units, Sign Conventions, Fresnel's prisms, rotary prism	5
3	Lenses – Definition, units, terminology used to describe, form of lenses	3
4	Vertex distance and vertex power, Effectivity calculations	3
5	Lens shape, size and types i.e. spherical, cylindrical, Sphero-cylindrical& Toric lenses Astigmatic lenses, Methods of writing prescriptions Axis Direction of astigmatic lenses Properties of crossed cylinders	2
6	Transpositions – Simple, Toric and Spherical equivalent	2
7	Prismatic effect, centration, decent ration and Prentice rule, Prismatic effect of Plano-cylinder and Spherocylinder lenses	6
8	Spherometer & Sag formula, Edge thickness calculations	4
9	Magnification in high plus lenses, Minification in high minus lenses	3
10	Tilt induced power in spectacles	2
11	Aberration in Ophthalmic Lenses	2
12	Raw materials – History and General Outline, Manufacturing of Ophthalmic Blanks – Glass & Plastics, Terminology used in Lens Workshops, Surfacing process from Blanks to lenses	6
13	Definition & Materials (Glass, Plastics, Polycarbonate, Triology) types and characteristics	5
14	Properties (Refractive index, specific gravity, UV cut off, impact resistance – include drop ball test, abbe value, Center thickness)	5

15	Best form of lenses & Safety standards for Ophthalmic lenses (FDA, ANSI, ISI, Others)	**3**
16	Design of High Powered Lenses Hi-index lenses, Calculation of Refractive index	**3**
17	Bifocal designs, their manufacturing & uses (Kryptok, Univis D, Executive, Invisible, Occupational)	**7**
18	Progressive Addition Lenses, modified near vision lenses (designs, advantages, limitations)	**4**
19	Lens enhancements (Scratch resistant coatings – spin/dip, Anti-reflection coating, UV coating, Hydrophobic coating, anti-static coating	**5**
20	Lens defects – Description and Detection	**3**
21	Glazing & edging (manual & automatic)	**3**
22	Special lenses ➢ Lenticulars ➢ Aspherics ➢ Fresnel lenses & Prisms ➢ Aniseikonic lenses ➢ Photochromics ➢ Polaroids ➢ Tinted lenses – Tints, filters	**8**
23	Project to ensure awareness on lens availability in Indian market	
24	History of Spectacles, manufacturing overview, Definition, parts & measurements Classification of frames – Materials (cover in detail), Colours and Temple position (advantages & disadvantages, where to use)	**3** **5**
25	Special purpose frames (sports, kids, reading)	**2**
		95 Hrs

DISPENSING OPTICS

SL NO	TOPICS	HOURS
1	Components of spectacle prescription & interpretation, transposition, Add and near power Relation	2
2	Frame selection – based on spectacle prescription, professional requirements, age group, face shape	4

3	Measuring Inter-pupillary distance (IPD) for distance & near, bifocal height	2
4	Lens & Frame markings, Pupillary centers, bifocal heights, Progressive markings & adjustments – facial wrap, pantoscopic tilt	2
5	Recording and ordering of lenses (power, add, diameter, base, material, type, lens enhancements)	2
6	Neutralization – Hand &lensometer, axis marking, prism marking	4
7	Faults in spectacles (lens fitting, frame fitting, patient's complaints, description, detection and correction)	3
8	Final checking & dispensing of spectacles to customers, counseling on wearing & maintaining of spectacles, Accessories – Bands, chains, boxes, slevets, cleaners, screwdriver kit	2
9	Spectacle repairs – tools, methods, soldering, riveting, frame adjustments	2
10	Special types of spectacle frames ➢ Monocles ➢ Ptosis crutches ➢ Industrial safety glasses ➢ Welding glasses	2
11	Frame availability in Indian market	
		25

RECOMMENDED BOOKS

1. Principles of Ophthalmic lenses — M.O.Jalie – 2nd edition
2. System for ophthalmic dispensing — Clifford.W.Brooks, Irwin.M.Borish
3. Clinical Optics — Troy Fannin, Theodore Grosvenor – 2nd edition
4. Ophthalmic lenses & Dispensing — M.O.Jalie – 2nd edition
5. Practical aspects of ophthalmic optics — MargeretDowaliby – 4th edition

VISUAL OPTICS (THEORY)

SL NO	TOPICS	HOURS
1	1. REVIEW OF GEOMETRIC OPTICS 1.1 Vergence and power 1.2 Conjugacy, Object space and image space 1.3 Sign convention 1.4 Spherical refracting surface 1.5 Spherical Mirror, catoptric power 1.6 Cardinal points 1.7 Magnification 1.8 Light and visual function , Clinical Relevance of: Fluorescence, Interference, Diffraction, Polarization, Bi-refringence, Dichroism 1.9 Aberration and application Spherical and Chromatin	5
2	OPTICS OF OCULAR STRUCTURES 2.1 Cornea and aqueous	
	2.2 Crystalline lens 2.3 Vitreous 2.4 Schematic and reduced eye	3
3	Basic Aspects of Vision. • Visual Acuity • Light and Dark Adaptation • Color Vision • Spatial and Temporal Resolution • Science of Measuring visual performance and Application to Clinical Optometry	5
4.	REFRACTIVE ANOMALIES AND THEIR CAUSES 4.1 Etiology of refractive anomalies 4.2 Contributing variabilities and their ranges 4.3 Populating distributions of anomalies 4.4 Optical component measurement 4.5 Growth of eye in relation to refractive errors	05
5	VISUAL ACUITY 5.1 Definition, specification, Conversion, measurement & Recording (Distance & Near) 5.2 Test types (Distance & Near) – standard, choice, types, construction 5.3 Illumination of consultation room 54 Contrast sensitivity– Definition, charts available, measurements and recordings 5.5 Trial set & Trial frame& Phoropter – advantages and disadvantages	5
6	REFRACTIVECONDITIONS Aetiology, optical condition, types, clinical features and management 1.1 Emmetropia/Ametropia 1.2 Myopia 1.3 Hyperopia 1.4 Astigmatism 1.5 Anisometropia And Aniseikonia 1.6 Presbyopia 1.7 Aphakia and pseudophakia, Biometry 1.8 Axial Vs Refractive Ametropia	18

7	ACCOMMODATION 7.1. Mechanism 7.2. Range & Amplitudes of accommodation 7.3. Anomalies of accommodation	03
8	CONVERGENCE 8.1. Types, measurement & Anomalies 8.2. Relation between accommodation & convergence	02
9	Retinoscopy (Static & Dynamic) 9.1. Principle, instrumentation & Types 9.2. Procedure & Interpretation of findings – Transposition & Spherical equivalent 9.3. Dynamic retinoscopy – various methods 9.4. Radical retinoscopy & Mohindra's near retinoscopy 9.5. Subjective refraction – Principle, astigmatic chart, binocular balancing & binocular refraction 9.6. Cycloplegic refraction	12
10	EFFECTIVE POWER & MAGNIFICATION 10.1. Ocular refraction Vs Spectacle refraction 10.2. Ocular accommodation Vs Spectacle accommodation 10.3. Spectacle magnification & Relative spectacle magnification 10.4. Retinal image blur – Depth of focus & Depth of field	02
		60Hrs

VISUAL OPTICS - PRACTICAL

SL NO	TOPICS	HOURS
Part I	1. Study of purkinje images I & II, III & IV 2. Mathematical models of the eye- Emmetropia, Hyperopia, & Myopia 3. Effect of trial lenses & accessories in front of the eye	
Part II	1. Visual acuity ✓ Measurement & recording (Distance & Near) 2.Retinoscopy – Practice of retinoscopy (Dry & wet) in ✓ Emmetropia, Myopia, Hypermetropia, Astigmatism, Anisometropia, Presbyopia, Aphakia, Pseudophakia, media opacities, strabismus & Eccentric fixation ✓ Interpretation of retinoscopic findings ✓ Subjective verification ✓ Prescription writing ✓ Methods of differentiating axial Vs Refractive ametropia ✓ Dynamic retinoscopy – Methods 3.Accommodation & Convergence ✓ Measurement of range & Amplitude of accommodation ✓ Measurement of Near point of Convergence	**60**
		60

RECOMMENDED BOOKS

1. Duke Elder's practice of refraction — David Abrams – 10th edition
2. Clinical refraction — Irwin.M.Borish
3. Primary care Optometry — Theodore Grosvenor – 4th edition
4. Clinical pearls in refractive care — D.Leonard Werner, Leonard.J.Press

OPTOMETRIC INSTRUMENTS

SL NO	TOPICS	HOURS
1	Pre examination history	02
2	Refractive Instruments 1.1 Visual acuity charts, Features, Advantages& disadvantages, newer developments 1.2 . Trial case lenses – best form lenses 1.3 . Trial frame design – Phoropter – Advantages & Difficulties 1.4 . Retinoscope – Optics, types, adjustments & special features 1.5 . Autorefractometer – Schenier's and other optical principles, Features, Advantages& disadvantages, newer developments 1.6 Vision analyzer 1.7 Potential Acuity Meter, 1.8 Pupilometer ,	10
3	Corneal Diagnostics Keratometer 1.1. Keratometric principle 1.2. Types – Bausch & Lomb, Javal-Schiotz models 1.3. Measurement, Documentation & Interpretation of data Corneal topography 2.1. Placido's disc 2.2. Photokeratoscope 2.3. Topography Modelling System 2.4. ORBSCAN & PENTACAM Aberrometer 3.1 Principle 3.2 Instrumentation, clinical procedure & Interpretation Pachymeter 4.1 Principle, Types 4.2 Instrumentation & Clinical procedure, Indications	18
4	Lens checking instruments 3.1. Optometer principle 3.2. Badal & Non-badal principle – advantages & disadvantages 3.3. Lens gauge or clock 3.4. Hand neutralization	06
5	Slit Lamp 4.1. Slit-lamp systems 4.2. Mechanical design 4.3. Illumination techniques 4.4. Accessories 4.5. Scanning laser devices	09

6	Glaucoma Diagnostics Tonometer 1.1. Types, principle & standardization (Schiotz, Applanation & NCT) 1.2. Measurement, documentation & interpretation of results Field of Vision and Screening Devices 2.1. Introduction – Visual fields & boundaries of visual fields 2.2. Visual field screening devices – Central & Peripheral 2.3. Quantitative perimetry – Manual & Automated 2.4. Results & Analysis of visual field examination Gonioscope 3.1. Principle & Instrumentation 3.2. Direct Gonioscope 3.3. Indirect Gonioscope Optical Coherence Tomography	07 15 04 05
	4.1 Anterior and Posterior OCT 4.2 Principle & Instrumentation 4.3 Clinical Procedure & Interpretation Glaucoma imaging& newer developments	
7	Color vision testing devices 8.1. Color vision theories 8.2. Common color vision defects 8.3. Pseudoisochromatic test plates 8.4. Color arrangement tests 8.5. Interpretation & clinical significance of findings	09
8	Ophthalmoscopes 10.1. Optical principle & Types 10.2. Direct ophthalmoscope – Instrumentation, Characteristics clinical procedure& Uses 10.3. Indirect ophthalmoscope – Instrumentation, Characteristics, clinical procedure & Uses 10.4. Direct ophthalmoscope Vs Indirect ophthalmoscope\ 10.5 Fundus biomicroscope- Principle & Instrumentation, Characteristics clinical procedure& Uses	08
9	Ophthalmic Ultrasonography 14.1. Physics of Ultrasonography 14.2. A-scan – Procedure & clinical uses 14.3. B-Scan – Procedure & Clinical uses	
10	Electrophysiology – ERG, VEP & EOG Principle & Instrumentation, Characteristics clinical procedure &Uses, interpretation of report	06
11	Fundus camera & Flourescine angiography	03

CLINICAL EXAMINATION OF VISUAL SYSTEM

SL NO	TOPICS	HOURS
1	History of the ophthalmic subject 1.1. Ocular history 1.2. Medical history 1.3. Family history 1.4. Systemic history	
2	Assessment of visual acuity 2.1. Distance & Near visual acuity 2.2. Color vision & Contrast sensitivity	

3	Examination of Extra Ocular Muscle balance	100
4	Assessment of accommodation & Convergence	
5	Pupil evaluation & Measurement of Inter pupillary distance (IPD)	
6	Slit Lamp examination 6.1. Examination of eye lids, conjunctiva & sclera 6.2. Examination of cornea & lens 6.3. Examination of iris, Ciliary body & pupil	
7	Examination of Intra ocular pressure – Schiotz& Applanation	
8	Assessment of angle of anterior chamber	
9	Ophthalmoscopy – Direct & Indirect	
10	Optic disc evaluation	
11	Examination of Lacrimal system	
12	Examination of orbit	
13	Macular function tests	
14	Visual field charting – Central & Peripheral	

RECOMMENDED BOOKS

1. Optometric instrumentation — David.B.Henson
2. Clinical ophthalmology (VOL-I) — Thomas.D.Duane
3. Primary care Optometry — Theodore Grosvenor – 4th edition
4. Clinical Procedures in Optometry — J.BoydEskside, John.F.Amos, Jimmy.D.Bartlet – 1st edition
5. Automated static perimetry — Anderson & Patella – 2ns edition
6. Investigative techniques & Ocular examination — Sandip Doshi, William Harvey
7. Diagnosis of defective color vision — Jennifer birch – 2nd edition

Pharmacology

SL No.		TOPICS	HOURS
1		GENERAL PHARMACOLOGY	5
		1.1 Introduction and sources of drugsRoutes of drug administration	1
		1.2 PHARMACOKINETICS – Absorption and bioavailability Distribution Biotransformation Excretion	2
		1.3 PHARMACODYNAMICS- Types and Mechanism of action Factors affecting Adverse drug reactions	2
2.		SYSTEMIC PHARMACOLOGY	24
	2.1 ANS	Introduction, neurotransmitters and mechanism of action	1
		Ophthalmic Uses and adverse effects of drugs affecting autonomic nervous system.	4
		Skeletal muscle relaxants	1
	2.2 CVS	ANTIHYPERTENSIVES	1
		ANTIANGINAL DRUGS	1
	2.3 RENAL	DIURETICS –EMPHASIS ON DRUGS USED IN OCCULAR DISORDER	1
	2.4CNS	SEDATIVE HYPNOTICS ALCOHOL	1
		GENERAL ANDLOCAL ANESTHETICS	1
		OPOIDS	1
		NON STEROIDAL ANTIINFLAMMAOTRY AGENTS	1
		Antihistaminic mast cell stabilizers	
	2.5 CHEMOTHERAPY	General Chemotherapy Examples/classification, antibacterial activity uses and adverse effects of Sulphonamides and fluoroquinolones Beta lactam antibiotics Tetracyclines and chloramphenicol Macrolides Aminoglycosides Others: Polymyxin Bacitracin	5

		Specific chemotherapy- in brief	3
		Antifungal Antiviral Antitubercular Antileprotics	
	2.6 HORMONES	Corticosteroids Antidiabetics	2
	2.7 BLOOD	Coagulants	1
3		OCCULAR PHARMACOLOGY	4
		3.1 Ocular formulations and Ocular routes of administration drug delivery system and special ocular drug delivery system 3.2 Ocular pharmacokinetics Delivery methods of Ocular Medication: Residence in the conjunctival sac, drug vehicles affect drug delivery, advanced ocular delivery systems, 3.3drugs induced Ocular toxicity	2 1 1
4		DIAGNOSTIC AND THERAPEUTIC APPLICATIONS OF DRUGS IN OPHTHALMOLOGY	11
		4.1 DRUGS USED TO ASSIST IN OCULAR DIAGNOSIS Anterior Segment and External Diagnostic Uses Posterior Segment Diagnostic Uses	1
		4.2 Drugs and biological agents used in ocular surgery Anesthetics used in ophthalmic procedures Presurgical Antiseptics Viscoelastic Substances Ophthalmic Glue Anterior Segment Gases Vitreous Substitutes Surgical Hemostasis and Thrombolytic Agents	2
		4.3 Drug s used in treatment of Glaucoma, Esotropia Ocular myasthenia	1
		4.3 Pharmacotherapy of ocular infections- Bacterial Viral Fungal and Chlamydial Protozoal	1
		4.4 Drugs used in allergic conditions, inflammatory disorders and degenerative disorders of the eye	1
		4.5 Immune modulators in ophthalmic practice	1
		4.6 Other agents used in ophthalmic practice Mydriatics and Miotics Enzymes Tracee elements Antioxidants Wetting Agents, Tear Substitutes, Osmotic Agents	2

		4.7 Miscellaneous Botulinum Toxin Type A in the Treatment of Strabismus, Blepharospasm, and Related Disorders Agents Used to Treat Blind and Painful Eye VITAMIN A	2

1. The pharmacological basis of therapeutics goodman Gilman 13th edition
2. Essentials of Medical Pharmacology KD Tripathi
3. Bartlett and Jaanus: Clinical Ocular Pharmacology
4. T S MAUGER & E L CRAIG - MOSBY'S - OCULAR DRUG HANDBOOK

MICROBIOLOGY

SL NO	TOPICS	HOURS
I	1. Sterilization and Disinfection generally used in laboratory and hospital practice 2. Details of common bacteria, viruses and other organisms 3. Morphology and principles of cultivation of bacteria 4. Common bacterial infections of the eye 5. Common fungal infections of the eye 6. Common viral infections of the eye 7. Common parasitic infections of the eye	15

RECOMMENDED BOOKS

1. Text book of microbiology- Ananth Narayan
2. Text book of microbiology- C.P baveja
3. Ocular Microbilogy- pk Mukherjee, preetibandyopadya

PATHOLOGY

SL NO	TOPICS	HOURS
	1. General introduction 2. Inflammation and repair 3. Infections [Tuberculosis, Leprosy, Syphilis, Fungus, Virus, Chlamydia] 4. Genetic abnormality 5. Hematology [Anemia, Leukemia, Bleeding disorders] 6. Circulatory disturbances [Shock, edema, Thrombosis, Infarction, Embolism] 7. Clinical pathology [Examination of urine and blood smears] 8. Ophthalmic wound healing 9. Eyelid [normal and pathology including inflammations and tumors] 10. Cornea [Normal and pathology in degeneration and dystrophies] 11. Lens [normal and pathology of cataract] 12. Retina [normal and pathology in inflammatory diseases, infections] 13. Intraocular tumors [Retinoblastoma and choroidal melanoma] 14. Orbit [inflammation and neoplasia] 15. Optic nerve [normal and tumor's]	15

RECOMMENDED BOOKS

1. General pathology- Harsh Mohan
2. Text book of Pathology - N.C.Dey
3. Basic Pathology- Robbins

CLINICAL PSYCHOLOGY

SL NO	TOPICS	HOURS
	1. Introduction to psychology 2. Intelligence, Learning, Memory, Personality, Motivation 3. Body integrity- one's body image 4. Patient in his Milan 5. Self-concept of the therapist, Therapist patient relationship-some guidelines 6. Illness and its impact on the patients 7. Maladies of the age and their impact on the patient's own and others concept of his body image 8. Adapting changes in vision 9. Why Medical Psychology needs / demands commitment?	20

PUBLIC RELATIONS

SL NO	TOPICS	HOURS
	1. Media and public relations 2. Communication sensitivity - Oneway- twoway communication - Listening evaluation- Active listening 3. Persuasive communication - Barriers to communication 4. Interpersonal Relationship – conflict management 5. Group process - Case discussion 6. Creative problem solving 7. Public relation and education 8. PR relevance in Indian context- Discussions 9. Behavior modification 10. Perception and personality 11. PR and hospitals 12. Leadership process 13. Conclusion- Relationship of these input to PR	15
		15 Hrs

HOSPITAL PROCEDURE

SL NO	TOPICS	HOURS
	1. General idea about the role, importance and procedures of the following within the hospital set up] 2. Medical records 3. Medical photography 4. Computer networking system 5. Laboratory technology	10
		10 Hrs

THIRD YEAR B.Sc. OPTOMETRY SYLLABUS

- Contact Lens
- Systemic Diseases (SecA) and Ocular Diseases (Sec B)
- Low vision aids &Geriatric Optometry
- Research Methodology & Statistics
- Pediatric Optometry, Squint and Binocular Vision and advance in optometry
- Practice management, law in optometry (Sec A) & occupational optometry (Sec B)

CONTACT LENS (THEORY)

SL NO	TOPICS	HOURS
1	1.1. Introduction to CL (Definition /Types) 1.2 History of Contact Lens 1.3 Review of Ocular Anatomy & Physiology A. Lids B.Tearfilm C. Lacrimal Apparatus D. Cornea E. Conjunctiva	6
2	2.1. Glossary of terms – Contact lenses 2.2. Optics of Contact Lens A. Magnification & Visual Field B. Accommodation & Convergence C. Back/Front Vertex Power (Vertex Distance Calculation) D. Axial & Refractive Ammetropia 2.3 Contact Lens materials A. Monomer/Polymer B. Properties of CL Material (RGP& SCL) 2.4 Manufacturing of CL (RGP, SCL& SOFT TORIC) 2.5. Indications & Contraindications	12

	3.1. Contact Lens Design & Parameters A. RGP contact lens design B. Soft Contact lens design 3.2 Preliminary Examination A. Instruments & Its use in Contact Lens Practice (Pachymeter /Specular Microscopy/ Keratometer/Placido Disc /Corneal Topography, Slit Lamp Biomicroscope) B. Steps of Preliminary Examination C. Significance of each steps 3.3 Parameter Selection (Base Curve/ Diameter) 3.4. Fitting philosophies	8
	4.1 Types of CL A. Soft Contact Lens(SCL) B. Soft toric Contact Lens (SOFT TORIC) C. Rigid gas Permeable Contact Lens(RGP) Indication, Parameter selection, Modification, Fitting assessment & Recording, Final Prescription, Dispensing & Follow up Visit with Examination for each type of CL 4.2 Fitting in astigmatism – Toric CL A. Stabilization Technique 4.3 Handling of Contact Lens (RGP/SCL/SOFT TORIC) A. Insertion& Removal (RGP/SCL/SOFT Toric) B. Do's & Don'ts	10
	5.1. Wearing Modalities/Replacement Schedule 5.2 Care & Maintenance (RGP/SCL) A. Cleaning Agent & Importance B. Rinsing agent & Importance C. Disinfecting Agent & Importance D. Lubricating & Enzymatic Action 5.2 Lens care and hygiene, instructions, compliance 5.3. Contact Lens solutions 5.4 Care of contact lenses	7
	6.1 Contact Lens Deposits (RGP/SCL) 6.2 Complication of contact lens (RGP /SCL)	6
	7.1 Specialty Contact Lens A. Therapeutic Contact Lens (Indication / Fitting Assessment) B. Pediatric Contact Lens Fitting (Aphakia& Pseudophakia) C. Post Refractive Surgery D. Fitting in irregular astigmatism – Keratoconus/PMD etc E. Contact lenses for special purposes – Swimming, sports, occupational etc F. Orthokeratology 7.2 Bifocal Contact Lens (Types/Indication/Fitting assessment)	7
	8.1. Modifications of finished CL 8.2. Inspection& Verification of finished contact lenses	2
	Review of Contact lenses & Solutions available in India	01

	10.1. Recent developments in contact lenses 10.2. Current contact lens research.	1
		60

CONTACT LENS PRACTICALS

SL NO	TOPICS	HOURS
1	1.1. Fitting& Dispensing of contact lenses in Myopia, Hyperopia, Astigmatism, Presbyopia, Anisometropia, Aphakia, Pseudophakia, Keratoconus, PMD etc 1.2. Pediatric contact lens fitting 1.3.CL fitting following ocular surgeries 1.4. Visit to factories manufacturing contact lenses	20

RECOMMENDED BOOKS

1. Contact Lenses — Antony.J.Philips, Janet Stone
2. Textbook of Contact Lenses — V.K.Dada – 4th Edition
3. Contact Lens Practice — Ruben &Guillon
4. Color Atlas of Contact Lens — Montague Rubem
5. Contact Lens – The CLAO guide — Peter.R.Castle
6. IACLE – Contact Lens modules — International Association of Contact Lens Educators, Sydney, Australia
7. Manual of Contact Lens prescribing & Fitting — Milton.M.Hom – 3rd edition
8. Manual of Gas Permeable contact Lens — Edward.S.Bennet, Milton.M.Hom – 2nd edition
9. Clinical manual of specialized CL prescribing — Terry.R.Scheid
10. Clinical Contact Lens Practice — Edward.s.Bennet, Barry.A.weissman
11. Cosmetic Contact Lens & Artificial eyes — Devendra Kumar & Gopal Krishnan
12. Common Contact Lens Complications — lyndon.W.Jones, Deborah.A.Jones
13. Anterior segment Complication of CL wear — Joel Silbert – 2nd edition
14. Contact lens practice — NatrhanEffron

OCULAR DISEASES

SL NO	TOPICS	HOURS
1	EYELIDS 1.1 Eye lid anatomy review 1.2 Congenital anomalies Blepharophimosis, Epicanthus, Cryptophthalmos, Coloboma, Hemangioma 1.3 Acquired disorders External and Internal hordeolum,Chalazion,Lidoedema, Blepharitis, Blepharospasm 1.4 Eyelid tumours Evaluation, Benign lesions, Malignant tumours 1.5 Malpositioning disorders Ectropion, Entropion, Trichiasis, Distichiasis, Symblepharon, Ankyloblepharon, Eyelid retraction, Lagophthalmos,Poliosis,Madarosis 1.6 Ptosis Classification, Clinical evaluation and Management 1.7 Eyelid trauma	5

2	LACRIMAL SYSTEM 2.1 Lacrimal anatomy review 2.2 Methods of Lacrimal evaluation 2.3 Congenital and developmental anomalies 2.4 Infections of lacrimal system	4
	2.5 Tumours of lacrimal system 2.6 Lacrimal trauma 2.7 Dry eye and Watering Etiology , Clinical evaluation and Management	
3	ORBIT 3.1 Orbital anatomy 3.2 Evaluation of orbital disordres 3.3 Congenital and developmental anomalies of orbit Anophthalmos, Microphthalmos,Nanophthalmos,Cryptophthalmos,Hypertelorism, Craniofacial anomalies,Craniosynostosis 3.4 Orbital tumours Dermoids, Hemangiomas, Rhabdmyosarcoma, Optic nerve glioma, Meningiomas, 3.5 Orbital inflammations Preseptalcellulitis,Orbitalcellulitis,Orbitalperiostitis,Cavernous sinus thrombosis, Sinus related disorders 3.7 Orbital trauma Blow out fractures 3.8 Proptosis Etiology, Classifications, clinical evaluation and Management 3.9 Graves Ophthalmopathy Etiology, Examination, and Management 3.10 Enophthalmos Etiology, Evaluation and Management	4
4	SCLERA 4.1 Sclera anatomy review 4.2 Blue sclera 4.3 Scleral Degenerations Ectasia and staphyloma 4.4 Scleral Inflammations Scleritis and episcleritis 4.5 Toxic and traumatic injuries of sclera	2

5	CONJUNCTIVA and CORNEA 5.1 Anatomy review <u>A) Conjunctiva</u> 5.2 Examination techniques 5.3 Inflammations of Conjunctiva Conjunctivitis (classification, etiology, evaluation and management) 5.4 Degenerative conditions Pinguecula, Pterygium, Concretions 5.5 Symptomatic conditions Hyperaemia, Chemosis, Ecchymosis, Xerosis, Discoloration, Papillae, Follicles, Hemorrhage 5.6 Cysts and tumours <u>B) Cornea</u> 5.7 Congenital anomalies Megalocornea, Microcormea,Cornea plana, Cloudy cornea 5.8 Corneal Dystrophies Classifications, evaluation and management 5.9 Corneal degenerations Arcus senilis, Hassal-henle bodies, Lipoid Keratopathy, Band shaped keratopathy, Salzmann's nodular degeneration, Droplet keratopathy, Pellucid Marginal Degeneration,Cornealguttatta 5.10 Keratoconus and Keratoglobus (Etiology, Classifications, Clinical evaluation and Management) 5.11 Corneal inflammations ✓ Keratitis/Ulcer (Etiology, Classifications, Evaluation and Management)	6
	✓ Corneal oedema ✓ Corneal opacity and neovascularization 5.12 Miscellaneous ocular surface disorders ✓ Keratoconjunctivitis Sicca ✓ Steven Johnson Syndrome ✓ Benign Mucosal Pemphigoid- ocular pemphigoid ✓ Vitamin A deficiency ✓ Trauma and burns ✓ Metabolic diseases associated with corneal changes 5.13 Corneal surgeries 5.14 Slit lamp colour coding	

6	LENS 6.1 Normal lens anatomy, physiology and aging process 6.2 Congenital and Developmental defects Aphakia, Lenticonus, Lentiglobus, Coloboma,Peters anomaly, Microspherophakia, Cataract 6.3 Acquired lenticular defects Morphological cataract Drug induced cataract Traumatic cataract Metabolic cataract Complicated cataract Association with other ocular disorders and syndromes 6.4 Cataract Management Surgical and non-surgical management Pre-operative evaluation Complications of cataract surgery 6.5 Lens displacement Lens subluxation and dislocation	5
	UVEA AND PUPIL 7.1 Congenital anomalies Heterochromia, Aniridia, Coloboma, Correctopia, Polycoria, Pupillary membrane 7.2 Inflammations of Uvea Classification of uveitis Etiology and pathogenesis Clinical approach to uveitis Endophthalmitis and panophthalmitis Complications of uveitis Ocular involvement in AIDS 7.3 Tumours of uvea 7.4 Anomalies of pupillary reactions	6
	VITREOUS 8.1 Developmental abnormalities Hereditary hyaloidoretinopathies Persistent hyperplastic primary vitreous 8.2 Vitreous opacities Asteroid hyalosis Cholesterolosis Pigment granules in vitreous Vitreous haemorrhage 8.3 Posterior vitreous detachment Etiology, Clinical features and Management 8.4 Trauma and vitreous 8.5 Inflammations and vitreous 8.6 Parasitic infestations 8.7 Vitreous complications secondary to surgery	2

	RETINA 9.1 Applied anatomy 9.2 Congenital and developmental anomalies Optic disc coloboma, Drusen, Hypoplasia, Medullated nerve fibers 9.3 Retinopathy of prematurity Etiology, Stages, Clinical features and Management 9.4 Retinal vascular diseases Diabetic retinopathy Associated with cardiovascular disease ✓ Hypertensive retinopathy ✓ Retinal artery and vein occlusions 9.5 Retinal Inflammations Retinitis, Retinal vasculitis 9.6 Retinal degenerations Retinitis pigmentosa, Lattice degenerations 9.7 Macular disorders Hereditary diseases Central serous retinopathy Cystoid macular oedema Solar retinopathy Albinism Age related macular degeneration Macular holes 9.8 Retinal detachment and Retinoschisis Etiology, Classifications, Clinical features and management 9.9 Retinal tumours ✓ Retinoblastoma ✓ Retinal and optic nerve head astrocytomas ✓ Lymphoid tumour 9.11 Miscellaneous disorders Epiretinal membranes Intraocular foreign bodies Other metabolic disorders of retina Diseases of choroidal vasculature and Bruch's membrane Diseases of retinal pigment epithelium 9.11 Fundus Drawing –colour coding	6
	NEURO OPHTHALMOLOGY 10.1 Applied anatomy review 10.2 Neuro ophthalmic examination ✓ History ✓ Visual acuity ✓ Colour vision ✓ Pupillary evaluation ✓ Ocular motility ✓ Fundus examination ✓ Visual field examination ✓ Adjunctive tests 10.3 Visual pathway and systems ✓ Vascular supply to anterior and posterior visual systems ✓ Visual pathway defects ✓ Disorders of visual integration ✓ Disorders of higher cortical functions ✓ Disorders with ocular motility anomalies/diplopia 10.4 Nystagmus Etiology, classifications, clinical evaluations and management	5

	10.5 Miscellaneous disorders ✓ Systemic disorders with neuro ophthalmologic signs ✓ Optic neuropathy ✓ Papilledema ✓ Papillitis	
	GLAUCOMA 11.1 Optic nerve, Anterior chamber and Aqueous Dynamics Review 11.2 Overview of glaucoma Diagnostic instruments 11.3 Evaluation of optic nerve head 11.4 Classification of glaucoma 11.5 Primary open angle glaucoma Etiology, clinical features, diagnosis and management 11.6 Primary angle closure glaucoma Etiology, clinical classification, clinical features, diagnosis and management 11.7 Developmental glaucoma Congenital glaucoma, Infantile glaucoma and juvenile glaucoma Syndromes with glaucoma 11.8 Secondary glaucoma Pseudoexfoliation glaucoma, pigmentary glaucoma, Inflammation induced, Neovascular glaucoma, Lens induced glaucoma, Traumatic glaucoma 11.9 Glaucoma management Pharmacological and surgical management 11.10 Glaucoma screening	5
	SYSTEMIC DISEASES	
1	ARTERIAL HYPERTENSION 1.1. Pathophysiology, classification, clinical examination, Diagnosis 1.2. Complications, management 1.3.Hypertension and the eye	30
2	DIABETES MELLITUS 2.1. Pathology, classifications, clinical features 2.2. Diagnosis, complications, management 2.3. Diabetes mellitus and the eye	
3	ACQUIRED HEART DISEASES- EMBOLISM 3.1. Rheumatic fever- Pathophysiology, classifications, diagnosis complications and management 3.2. embolism 3.3.Subacute bacterial endocarditis	
4	CANCER –INTRODUCTION 4.1. Definition, nomenclature, characteristics of benign and malignant 4.2. Grading of staging of cancer, diagnosis, principles of treatment 4.3.Neoplasia and the eye	
5	CONNECTIVE TISSUE DISEASES 5.1. Anatomy and pathophysiology: arthritis 5.2.Eye and connective tissue diseases	
6	THYROID DISEASE 6.1. Anatomy and physiology of thyroid gland 6.2. Classification of thyroid disease 6.3. Diagnosis, complications, clinical features, management 6.4.Thyroid disease and the eye	

7	TUBERCULOSIS 7.1. Etiology, pathology, clinical features, pulmonary tuberculosis, diagnosis, complication, treatment 7.2.Tuberculosis and the eye	
8	8.1 Herpes virus (Herpes simplex, Varicella Zoster, Cytomegalovirus, Epstein Barr Virus) 8.2 Herpes and the eye	
9	Hepatitis (Hepatitis A, B, C) 2	
10	Myasthenia Gravis	
11	HELMINTHIASIS 8.1. Classification of helminthic diseases, - schistosomiasis, 8.2. principles of diagnosis and management 8.3.Helminthic disease and the eye[Taenia., echinococcus, larva migrans	
12	COMMON TROPICAL MEDICAL AILMENTS 9.1. Introduction to tropical diseases: malaria 9.2.Tropical diseases and the eye- leprosy, toxoplasmosis, syphilis, Trachoma	
13	MALNUTRITION 10.1.Etiology & nutritional disorders of the eye	
14	INTRODUCTION TO IMMUNOLOGY 11.1. Introduction& components of immune system 11.2. Principles of immunity in health 11.3. Immunology in disease 11.4.Immunology and the eye	
15	GENETICS 12.1. Introduction to genetics 12.2. Organisation of the cell 12.3. Chromosome structure and cell division 12.4. Gene structure and basic principles of genetics 12.5. Genetic disorders and their diagnosis 12.6. Genes and the eye 12.7.Genetic counseling and genetic engineering	
		80 Hrs

RECOMMENDED BOOKS

1. Clinical Ophthalmology — Jack.J.Kanski – 4th edition
2. Textbook of Ophthalmology — A.K.Khurana
3. Parson's diseases of the eye — Revised by RamanjithSihota& Radhika Tandon
4. Glaucoma Handbook — Anthony.B.Litwak

LOW VISION AIDS (THEORY)

SL NO	TOPICS	HOURS
1	Introduction 1.1. Definition & Classification 1.2. Causes of Low Vision 1.3. Optometrist's role in Low Vision management	02
2	Examination of a Patient with Low vision 2.1. Case history 2.2. Visual acuity ✓ Distant vision – Charts, measurement & Documentation ✓ Near vision - Charts, measurement & Documentation ✓ Refraction – Significance & Technique ✓ Diagnostic procedures in low vision examination Screening for vision disability • A collaborative model of service delivery • Teaching other staff how to screen for vision disability and refer to you • Six sensory impairments, realistic simulations and performance signs Impaired acuity Impaired contrast sensitivity Central field loss Peripheral field loss Oculomotor problems Perceptual impairment • Normal age related vision loss • Pathogenesis • Sighted guide instructional video	15
3	Optics & Characteristics of Low vision aids 3.1. Magnification 3.2. Galilean telescope Vs Keplarian Telescopes 3.3. Spectacle magnifiers 3.4. Hand Magnifiers 3.5. Stand Magnifiers 3.6. CCTV 3.7. Bioptic telescopes 3.8.Accessory low vision aids	5
4	Selection of Low vision aids for distance, intermediate & Near	02
5	Guidelines & training to use various aids	02
6	Choices of tests & Aids in various pathological conditions 6.1. Conditions causes overall blurring of the visual field 6.2. Condions causes central field defects 6.3.Conditions causes peripheral field defects	05
7	Light, glare & Contrast in Low vision care & Rehabilitation	01
8	Children with low vision	01
9	Genetics	01
10	Rehabilitation of visually handicapped	01
11	Definitions and eligibility for services in India	02
12	Description of advanced low vision devices and their practice	03
		40

	LOW VISION AIDS - PRACTICAL	
1	Demonstration followed by evaluation of a low vision patient by students ▪ Low vision case history ▪ Visual acuity measurement & Documentation ▪ Refraction ▪ Needed diagnostic tests for each pathological condition ▪ Selection, trial & dispensing of visual aids ▪ Rehabilitation methods	10

RECOMMENDED BOOKS

1. Low vision care- E.B.Mehr, Allen.N.Fried
2. Clinical Low vision- Eleanor.E.Fay

GERIATRIC OPTOMETRY

SL NO	TOPICS	HOURS
1	1.1. Introduction 1.2. structural& physiological changes in the eye associated with ageing ✓ Structural changes to lid & adnexa ✓ Physiological changes to cornea, lens & Uvea ✓ Degenerative & Physiological changes in vitreous, choroid & retina	2
2	2.1. Optical& refractive changes ✓ Refractive changes in cornea, lens & vitreous ✓ Refractive changes due to diabetes ✓ Refractive changes due to uveitis	03
3	✓ Cataract ✓ Glaucoma ✓ Macular disorders ✓ Vascular disorders	03
4	Optical correction of refractive conditions	02
5	Dispensing in geriatric age groups ✓ Spectacle ✓ Contact lenses	03
		15Hrs

RECOMMENDED BOOKS

1. vision of the ageing patient — Hirsch Wick
2. Vision &Aeing – General & Clinical perspective — Alfred Rosenboom, Meredith.W.Morgan
3.Clinical refraction — Borish

PEDIATRIC OPTOMETRY

SL NO	TOPICS	HOURS
1	Introduction 1.1. Review of ocular anatomy & Physiology 1.2.Visual development-– visual system, visual acuity, refractive error, contrast sensitivity function, eye movements, accommodation, binocular vision, color vision	03
2	Pediatric case history 2.1. Genetic factors 2.2. Prenatal factors 2.3. Perinatal factors 2.4.Postnatal factors	04
3	Normal Appearance, pathology and structural anomalies of ✓ Orbit ✓ Eyelids ✓ Lacrimal system ✓ Conjunctiva ✓ Cornea ✓ Sclera ✓ Anterior chamber, Uveal tract, pupils ✓ Lens ✓ Vitreous, Fundus ✓ Oculomotor system	03
4	Ocular Examination 4.1. Measurement of visual acuity ✓ Various visual acuity charts for different age groups ✓ Teller acuity chart & VEP 4.2. Measurement of refractive status ✓ Dry & Cycloplegic refraction ✓ Interpretation of results 4.3. 4.3. Assessment of oculomotor function 4.4. Measurement of fusion and stereopsis, color vision 4.5. Assessment of accommodation & Convergence	06
5	Post examination processes 5.1. Compensatory treatment & remedial therapy for ✓ Myopia ✓ Pseudomyopia ✓ Hyperopia ✓ Astigmatism ✓ Anisometropia ✓ Strabismus ✓ Nystagmus	04
6	Pediatric dispensing ✓ Spectacles ✓ Contact Lenses	04

		20 Hrs

RECOMMENDED BOOKS

1. Principles & Practice of pediatric optometry — Alfred Rosenboom, M.W.Morgan
2. Pediatric Optometry — Jerome Rosner
3. Clinical pediatric optometry — Leonard.J.Press – 1st edition
4. Visual Development, Diagnosis, Treatment of the Pediatric Patients — Robert H Duckman

BINOCULAR VISION & ADVANCES IN OPTOMETRY (THEORY)

SL NO	TOPICS	HOURS
1	Binocular Vision and Space perception. ➢ Relative subjective visual direction. ➢ Retino motor value ➢ Grades of BSV ➢ SMP and Cyclopean Eye ➢ Correspondence, ➢ Fusion, Diplopia, Retinal rivalry ➢ Horopter ➢ Physiological Diplopia and ➢ Suppression ➢ Stereopsis, Panum's area, BSV. ➢ Stereopsis and monocular clues -significance. ➢ Egocentric location, clinical applications. ➢ Theories of Binocular vision.	
2	Anatomy of Extra Ocular Muscles. ➢ Rectii and Obliques, LPS. ➢ Innervation & Blood Supply. Physiology of Ocular movements. ➢ Center of rotation, Axes of Fick. ➢ Action of individual muscle. Laws of ocular motility ➢ Donder's and Listing's law ➢ Sherrington's law ➢ Hering's law Uniocular & Binocular movements - fixation, saccadic & pursuits. ➢ Version & Vergence. ➢ Fixation & field of fixation	06
3	Near Vision Complex Accommodation ➢ Definition and mechanism (process). ➢ Methods of measurement. ➢ Stimulus and innervation. ➢ Types of accommodation. ➢ Anomalies of accommodation – aetiology and management.	04

4	Convergence ➢ Definition and mechanism. ➢ Methods of measurement. ➢ Types and components of convergence - Tonic, accommodative, fusional, proximal. ➢ Anomalies of Convergence – aetiology and management.	06
5	Sensory adaptations Confusion	02
6	Suppression Investigations Management Blind spot syndrome	04
7	Abnormal Retinal Correspondence Investigation and management Blind spot syndromeSurgical	02
8	Eccentric Fixation Investigation and management	02
9	Amblyopia Classification Aeitiology Investigation Management	04
10	Neuro-muscular anomalies Classification and etiological factors	02
11	History – recording and significance.	02
12	Convergent strabismus ➢ Accommodative convergent squint ➢ Classification ➢ Investigation and Management ➢ Non accommodative Convergent squint ➢ Classification ➢ Investigation and Management	06
13	Divergent Strabismus Classification A& V phenomenon Investigation and Management	04
14	Vertical strabismus Classification Investigation and Management	02
15	Paralytic Strabismus Acquired and Congenital Clinical Characteristics Distinction from comitant and restrictive Squint	04
16	Investigations ➢ History and symptoms ➢ Head Posture ➢ Diplopia Charting ➢ Hess chart ➢ PBCT ➢ Nine directions ➢ Binocular field of vision	12
17	Non-surgical Management of Squint	02
18	Restrictive Strabismus Features ➢ Musculofascical anomalies ➢ Duane's Retraction syndrome ➢ Clinical features and management ➢ Brown's Superior oblique sheath syndrome ➢ Strabismus fixus ➢ Congenital muscle fibrosis	06

BINOCUALR VISION ADVANCES IN OPTOMETRY – PRACTICALS

SL NO	TOPICS	HOURS
1	Strabismus assessment ✓ Cover test, Krimsky, Synaptophore, Sterioacuity test, Diplopia charting Examination procedures of different types of strabismus and its non-surgical management.	**20**
		20 Hrs

RECOMMENDED BOOKS

1. Binocular vision & Ocular motility — Von Noorden – 6th edition
2. Clinical management of binocular vision — M.Scheimann, Bruce Wick – 2nd edition
3. Binocular anomalies — John.R.Griffin, J.David Grisham – 4th edition
4. Practical binocular vision assessment — Frank Eperjesi, Michelle.M.Rundstorm
5. Binocular vision & Orthoptics — Bruce Evans, Sandip Doshi

PRACTICE MANAGEMENT

SL NO	TOPICS	HOURS
1	1. Basics of book keeping 2. Data management 3. Record keeping 4. Clinic management 5. Staff management 6. Inventory control 7. Public relations. • Definitions. PR- Its disfunction from publicity, propaganda & advertising. • Internal and external aspects of PR Phases of PR: analysis building, promotion of product or services, better employee, government and community relation. 8. Methods of public relations: • Pres relations: Press release, Press conference and Letter to editor • Printed work: Style, colour & design. 9. Basic Accountancy and Public relations • Introduction • Terms used in accounts, Principles of accountancy. • Journal & Ledger • Trial Balance	**10**

	• Subsidiary books, Petty cash books, sales register, purchase register, stock register • Bank reconciliation and Banking procedures • Depreciation • Balance sheet and profit and loss accounts • General ideas about Income tax and sales tax. • Project report and financial inability. • Costing in practice (Buying, stock-keeping, assessment of fees and costing of appliance).	
		10 Hrs

LAW AND OPTOMETRY

SL NO	TOPICS	HOURS
	1. Legal environment and techniques- History – law and equity 2. History and theory of licensure 3. Licensure as a means of internal and external discipline- unprofessional conduct- incompetence- gross immorality 4. International optometry- important foreign optometry law 5. Optometrist in court 6. Malpractice- theory of liability- damages –minimizing malpractice claims 7. Insurance 8. Negligence 9. Ethics – professional ethics 10. Laws governing practice of medical and paramedical profession in India 11. Registered medical practitioner- laws against practice of medicine of those unregistered- medical council of India- dental council- nursing council 12. Present rules and regulations – laws regarding optical product Manufacturers- dispensing in India 13. Opticians- are they registered? Dispensing opticians- rules in UK	10

OCCUPATIONAL OPTOMETRY

SL NO	TOPICS	HOURS
1	1.1. Introduction to occupational health, hygiene and safety 1.2.International bodies like ILO, WHO, national bodies like labour institutes, National institutes of occupational health, national safety council etc	
2	Acts and rules, 2.1. Factories act and rules 2.2.Workmen's compensation act, ESI act etc	
3	4.1 Light / Illumination (Defination, Units ,Sources,advantages,disadvantages) 4.2 Color (Defination,Color defects, Color vision tests) 4.3 Introduction to Different Occupation Occupation where Illumination and Color vision is Important	

4	5.1 Occupational Hazards A. Physical Hazards B. Biological Hazards C. Ergonomic Hazards D. Air-Borne Hazards E. Chemical Hazards Example of Occupation related to each Hazards 5.2 Radiation (Electromagnetic radiation, Ionizing& Non ionizing, Infrared, Ultraviolet, Microwave & laser) 5.3 Pesticides – General & Ocular defects 5.3 Occupational hygiene & ergonomics A. Environmental monitoring B. Recognition, evaluation and control of hazards	20
5	6.1 Occupational diseases A. Occupation related diseases caused by (Physical agents, Chemical agents Biological agents) 6.2 Common Systemic Disease Associated with Various Occupation 6.3 Common Ocular Disease in Various Occupation 6.4 Visual Problems in various Occupation 6.4 Occupational safety A. Prevention & Protective Methods B. Personal protective equipment ✓ Goggles, Face shields etc Selection, use & Testing for standards 6.5 Occupational Accidents 5.1. Causes of accidents 5.2. Accident analysis, accident prevention	
6	7.1 Task Analysis of Occupation 7.2 Vision Standards for Occupation like Railways, Roadways, Airlines etc	
7	Prevention of occupational diseases ✓ Medical examination / medical monitoring ✓ Pre-employment/pre- placement examinations	
8	Visual Display Unit (Computer ,Laptop, Digital Devices)	
9	Contact lens & work	
10	11.1 Role of optometrist – promotion of general and visual health and safety of people at Work 11.2 Industrial visits & Industrial Vision Screening	
		20 Hrs

RECOMMENDED BOOKS

1. Public health and community Optometry	Robert.D.Newcomb, Jerry.L.Jolly
2. Industrial & Occupational ophthalmology	Samuel.L.Fox
3. Guide to occupational and other visual needs	Holmes
4. Work and the eye	Raechel.V.North
5. Diagnosing and treating computer related vision problems	Sheedy, Shaw-McMinn
6. Principles of Ophthalmic lenses	M.O.Jalie – 2nd edition
7. System for ophthalmic dispensing	Clifford.W.Brooks, Irwin.M.Borish
8. Clinical Optics	Troy Fannin, Theodore Grosvenor – 2nd edition
9. Ophthalmic lenses & Dispensing	M.O.Jalie – 2nd edition
10. Practical aspects of ophthalmic optics	MargeretDowaliby – 4th edition

RESEARCH METHODOLOGY & STATISTICS

SL NO	TOPICS	HOURS
1	**Introduction I: Biostatistics** ✓ Definition ✓ role of statistics in health science and health care delivery system	60
2	**Introduction II: Research Methodology** ✓ Research process ✓ Steps involved in research process ✓ Research methods and methodology	
3	**Variables and scales of measurements** ✓ Definitions and examples of qualitative, quantitative, continuous discrete, dependent and independent variables. ✓ Definitions, properties and examples of nominal, ordinal, interval and ratio scales of measurements.	
4	Sampling ✓ Population, sample, sampling, reasons for sampling, probability and non-probability sampling. ✓ Methods of probability sampling – simple random, stratified, systematic- procedure ✓ Merits and demerits. ✓ Use of random number table.	
5	**Organization of data** ✓ Frequency table, histogram, frequency polygon, frequency curve, bar diagram, pie Chart	
6	**Measures of location** ✓ Arithmetic mean, median, mode, quartiles and percentiles – definition ✓ Computation (for raw data), merits, demerits and applications	
7	**Measures of variation** ✓ Range, inter-quartile range, variance, standard deviation, coefficient of variation- definition ✓ Computation (for raw data), merits, demerits and applications	

8	**Normal distribution** ✓ Concept, graphical form, properties, examples ✓ Concept of Skewnes and Kurtosis	
9	**Correlation** ✓ Scatter diagram ✓ concept and properties of correlation coefficient, examples [No computation]	
10	**Health Information System** ✓ Definition, requirement, component and uses of health information system. ✓ Sources of health information system- Census, Registration of vital events, Sample registration system (SRS), Notification of diseases, Hospital records, Disease registries, Record linkage, Epidemiological surveillance, Population survey	
11	**Vital statistics and hospital statistics** ✓ Rate, ratio, proportion, Incidence, Prevalence. Common morbidity, mortality and Fertility statistics – Definition and computation.	
12	**Hypothesis** ✓ What is hypothesis ✓ Formulation of hypothesis ✓ Characteristics of good hypothesis.	
13	**Epidemiology** ✓ Concept of health and disease ✓ Definition and aims of Epidemiology, ✓ Descriptive Epidemiology- methods and uses.	
14	Concept of reliability & validity	
		60 Hrs

RECOMMENDED BOOKS

1. Methods in Biostatistics for medical students & Research workers — Mahajan B.K.- 6th edition
2. Research methodology – Methods & techniques — Kothari.C.R
3. Introduction to Biostatistics: A manual for students in health sciences — Sundar Rao PSS, Richard.J
4. Text book of Preventive and social medicine — Park.E.Park

Public Health & Epidemiology

SL NO	TOPICS	HOURS
	Public Health & Epidemiology 1. Public health &Community optometry- concepts and implementation 2. Global medicine and evolution of public health in India 3. Health care delivery systems in India and determinants of health 4. Quality assessment in health delivery program 5. Natural history of disease, transmission of disease 6. Levels of prevention – optometrist's role in community 7. Concepts of national health program 8. Screening in population (Screening for eye disease) 9. Epidemiology of blindness- cataract, glaucoma, deficiency disorders 10. Eye care in Primary Health care 11. Community Eye Care Programs 12. Community based Rehabilitation Program 13. Vision 2020: The Right to Sight 14. Scope of geriatric ophthalmology in preventive and rehabilitation care 15. Basics in research methodology in populations 16. Demography and vital statistics (This can be a part of Research Methodology) 17. National and international agencies in health care 18. Fundamentals of health economics, health plan 19. Evaluation &Assessment of Health Program 20. Role of Optometrist in Public Health & Community Optometry 21. Role of Optometrist in school eye screening Program 22. Community outreach-camps and school screening program	20

CLINICS AND SPECIAL CLINICS

No. of practical hrs. : 270

1. Case sheet
2. History taking
3. Lensometry
4. Visual acuity
5. Tests for phorias and tropias
6. External examination
7. Slit lamp examination
8. Drugs and method of application
9. Do's and don'ts – Pupillary dilatation
10. Direct ophthalmoscopy
11. Indirect ophthalmoscopy
12. Instrumentation
13. Patients selection
14. Keratometry reading
15. Refraction
16. Fluorescein pattern
17. Overrefraction
18. Fitting of hard lenses
19. Rigid gas permeable lenses and soft lenses in refractive errors and in specialized condition

The students are made to observe the internees initially, then gradually they are encouraged to work up a patient and perform various examination techniques.

FOURTH YEAR

- **PROJECT WORK**
- **CLINICAL POSTING & SECIALITY POSTING**

LEARNING AND TEACHING STRATEGY

The curriculum of Optometry is designed in such a way that it ensures the development of professional skills as well as behaviors of an individual that helps them to deliver a comprehensive primary eye care to the needy.

The curriculum incorporates 4 Major phases

Phase - I (First year Optometry)

The emphasis of learning is understanding & analysis of the basic sciences, philosophies, theories & skills required to develop professionally and academically. This theory oriented first year ensures a sound scientific foundation for the upcoming years.

Phase - II (Second year Optometry)

The curriculum arranged in this part allows the students to apply the basic science knowledge procured from Phase-I in the Optometry topics. The introductory clinical posting in the ophthalmic outpatient department helps them to understand and learn the primary eye care procedures.

Phase – III (Third year Optometry)

As the curriculum concentrates more on optometric patient evaluation and management, the focus is to refine the student's clinical and application skills to make him/her an Optometrist. The student will learn about the diagnostic approaches and management of various ocular disorders, binocular vision anomalies, assessment and dispensing of contact lenses and Low vision aids.

Phase – IV (Fourth year Optometry)

This one-year compulsory course work program is designed to facilitate the transition from student hood to a competent optometrist.

The learning and teaching process includes;

- Lectures
- Practical demonstration
- Projects & Assignments
- Seminars
- Case discussions
- Journal clubs
- Clinical teaching
- Industrial visits
- Community outreach

CLINICAL POSTINGS

Aim: To enable the students to learn the Optometric examination procedures, clinical assessment skills and management techniques which helps them to become a competent clinician.

Description: The students will be posted in different specialties of eye care on a rotatory basis under the supervision of experienced clinical supervisors.

Clinical Posting – IInd Year:

At the end of second year clinical postings, the students will be performing History recording (Ocular and systemic – of relevance), Visual acuity assessment and documentation (Adults & Infants), Objective and subjective refraction, Spectacle prescription, Dispensing of various types of lenses and frames, Lensometry, Keratometry, demonstrating the slit lamp illumination techniques, color vision assessment, Do's and Don'ts of pupillary dilatation, Gross ophthalmic examination etc. under experienced clinical supervisors.

TOTAL CLINICAL HOURS (IIND YEAR): **200 HOURS/YEAR**

Clinical Posting – IIIrd year:

By the completion of IIIrd year clinical posting, the students will be able to perform the following under experienced clinical supervisors.

- Optometric workup to detect the ocular disorders (Ocular & relevant systemic history, Visual acuity assessment and refraction, Slit lamp examination, applanation Tonometry, fundus evaluation)
- Contact lens workup
- Low vision workup
- Orthoptic workup

TOTAL CLINICAL HOURS (IIIRD YEAR): **575 HOURS/YEAR.**

Clinical Postings – IV th year:

Successful completion of the course work program will facilitate the students to become competent independent Optometrist. The student will be proficient in

- Complete Optometric workup including diagnosis and management
- Contact lens workup including dispensing
- Low vision workup, dispensing of aids and counseling
- Orthoptic workup and non-surgical management
- Detection of ocular diseases and referral to specialists at the appropriate stage
- Managing an optical outlet/clinic of his/her own.
- Screening of Ocular disorders in community outreach programs like Camps, School screening etc.
- Utilizing the latest technology in the diagnosis of ocular anomalies including visual field devices, Gonioscopy, imaging technology including ultrasound and retinal imaging techniques, corneal topography including ORBSCAN, Electrophysiology, etc

SUPERVISED CLINICAL HOURS DURING COURSE WORK: **1800 HRS**

PROJECT:

No. of practical hrs: 144

Each student is encouraged to take up a research project in the area of his/her liking. The project should be original and should have considerable clinical relevance. The concerned faculty members guide the student in his/her project. After completing the project, each student has to submit a complete report of their respective projects

PROJECT GUIDELINES

All Bsc.optometry degree students enrolled in the Rajiv Gandhi University of Health Sciences should complete a scholarly project as partial fulfillment of requirements for the award of Bsc optometry (OPTOMETRY) degree.

What is a project?

A Project is a preliminary form of research. It is an independent investigation. It is very largely the students's own work and is to be pursued by them from the inception till completion. A master's project (non-thesis) will be completed during the third year and involves the student in a hands- on project led by a research supervisor/ faculty advisor who will choose, develop and guide the project from its inception to completion.

Purpose of a project work

The purpose of the Project Work is to enable the student to gain practical experience. It enables the student to meet program objectives through development of an appreciation of the interrelations between theory research and practice. A project forms an introduction to scientific thinking and working.

Project suggestions

Prior to the practical work, students work out a concept with their supervisor that could include any of the following points:

- Scientific question
- Educational objectives (which methods have to be mastered and understood)
- Recent trends in the respective fields
- Case study
- Prospective studies
- Retrospective studies

This scholarly project provides the student with the opportunity to participate in a mentored research experience. The student will actively participate in a research project throughout all current applicable phases of the project such as the problem statement development, review of the literature, hypotheses formation, proposal writing, study design, data collection, data analysis, and result reporting. This may be done as a group project. A portfolio, paper, or poster is a presentation of those outcomes.

Project supervision

The supervisor schedules the project work together with the student and provides an introduction to all laboratory skills that are needed. She or he is then the contact person for all questions and problems during the project. If required, she or he may also ask for a progress report and preliminary results while the project is still ongoing.

The eligibility academic qualification and teaching experience required for recognition as research supervisor and faculty advisor by the RGUHS are:

a. Eligibility to be a research supervisor and faculty advisor
   Shall be a full time teacher in the college or institution where he or she is working.
b. Academic qualification and teaching/professional experience for each branch
   - Research supervisor (RS)- five years of teaching/ professional experience after the postgraduate qualification in a teaching institution or laboratory approved by RGUHS
   - Faculty advisor (FA)- three years of teaching/ professional experience after the postgraduate qualification in a teaching institution or laboratory approved by RGUHS
c. Age:
   The age of the RS/ FA shall not exceed 65 years.

Assessment
Four copies of the project report should be submitted to the Principal along with a soft copy (CD), three months before the final examinations. Projects are assessed with a written report and a seminar. The written report and the presentation, as well as the practical work in the laboratory are to be included in the internal assessment. The Project report will carry 10 marks which would be assessed and awarded during the viva voce examination and added along with the viva voce marks.

GUIDELINES FOR THE PREPARATION OF PROJECT REPORTS

1. The project report should be typed in Times New Roman. The size of the titles should be 14 and Bold and the size of the subtitles should be 12 and bold.
2. The matter should have double spacing except for long quotations, footnotes and endnotes, which are single spaced. The left hand margin must be 1.5", other margins should be 1.0".
3. The project report should be hardbound.
4. The project report should be organized in the following subdivisions:
   a. Title page
   b. Certificate
   c. Acknowledgement
   d. List of abbreviations used
   e. Table of contents
   f. Introduction
   g. Main project
   h. Summary of the project work
   i. List of references
   j. Annexures

a. Title page

<----------Title ---------->
<----------Subtitle ---------->
by
Name of the Candidate
Project Report

In partial fulfillment
of the requirements for the degree of
Degree Name
in
Subject Name
Under the guidance of
Name of the RS and FA
Name of the Department
Name of the College
Place
Year

b. Certificate

CERTIFICATE BY THE RESEARCH SUPERVISOR

This is to certify that the project report entitled "<----------Title ----------" is a bonafide research work done by Name of the Candidate in partial fulfillment of the requirement for the degree of Degree Name.

Date: **Signature of the Research Supervisor**
Name
Place: **Designation & Department**

ENDORSEMENT BY THE HOD, PRINCIPAL/HEAD OF THE INSTITUTION

This is to certify that the project report entitled "<----------Title ----------" is a bonafide research work done by Name of the Candidate under the guidance of Name & designation of the Guide.

Seal & Signature of the HOD **Seal & Signature of the Principal**

Name **Name**

Date:
Place:

c. Acknowledgement

The inclusion of a paper of Acknowledgment is a traditional practice in the write up of the Project Work. This permits the candidate to write a brief perface and acknowledge the help received from persons and organizations.

d. List of abbreviations used

e. Table of Contents

f. Introduction

This section includes a brief write up about the topic, its scope and importance as well as relation to any previous studies done in the particular topic. It should also mention any present developments.

g. The main project

The main project should be divided into various sections as per the demand of the topic.

h. Summary of the project work

i. List of References (Vancouver Style)

References should be numbered consecutively in the order in which they are first mentioned in the text; they should not be listed alphabetically by author or title or put in date order.

j. Annexures

POINTS TO KEEP IN MIND

- The project work should be an original document and in the candidates own language.
- The candidate should not copy or reproduce anyone else's published or unpublished project.
- Any arguments that are put forward in the project should be supported with appropriate data.
- Proper documentation of the information is very important.
- The methodology to be used should be very clearly stated in the beginning of the work.
- Plagiarism should be avoided.

WHAT IS PLAGIARISM?

Plagiarism means to use some other person's ideas and information without acknowledging that specific person as the source.

CLINICAL POSTING:

A student after having successfully completed the final year university examination is qualified to commence the Compulsory Rotatory Internship. The completion of Internship is mandatory to enable a student to obtain the bachelor degree in OPTOMETRY

GUIDELINES

- Interns should complete postings in all specialities as decided by the department
- The interns should conduct themselves in a manner befitting the profession.
- The intern should dress appropriately in the clinical areas
- It is mandatory for the intern to wear the white apron with nametag while attending clinics
- A total of12 days' leaves can be availed for a period of one year. He/she is permitted to avail 1day's casual leave in each posting/month or six days of casual leave at a stretch with prior

permission from staff in-charge

- If the student takes more leaves than that can be availed, they have to extend the internship equal to the period of leaves taken

- Students are allowed to do externship only in institutions decided by the department and college on rotation basis. At least 3 months' compulsory internship has to be done in the parent institution
- Working hours in the parent institution is from 8.30am to 5.00pm. He/she should sign the attendance register before 8.30am
- Each intern should maintain a logbook wherever he/she is posted. The intern has to get signature from the supervising staff at the end of each posting
- Log book should be submitted to the Head of the department at the end of each posting of internship after the period of posting
- Accommodation for externship will be the sole responsibility of interns. Neither the department nor the college is responsible for providing accommodation
- Feedback of interns from the respective institutions during externship is mandatory
- Assignments/presentations given during the period of internship has to be duly undertaken and performed.
- Internship completion certificate will be issued from the College office only after obtaining satisfactory completion certificate from the Head of the Department
- The intern in the parent institute will get a monthly stipend. There is no stipend for off campus posting.
- The intern will be allowed to attend the National Conference, leave will be granted only for the days of conference and travel days. Any other leave declared by the University for the students will not apply to the interns