

**KERALA UNIVERSITY OF HEALTH  
SCIENCES**

**SYLLABUS OF THE 4 YEAR**

**B.Sc OPTOMETRY DEGREE COURSE**

**(3 YEARS COURSE AND ONE YEAR practical training)**

## **B.Sc OPTOMETRY COURSE – B.Sc. (OPT)**

### **PROPOSED REGULATION, SCHEME AND SYLLABUS OF THE DEGREE OF BACHELOR OF SCIENCE IN OPTOMETRY**

#### **NAME OF THE COURSE**

The name of the course shall be “Bachelor of Science in Optometry” – B.Sc. (OPT)

#### **AIMS OF THE COURSE**

The Course aims at carving out graduates in Optometry who will be well versed in

- Helping the Ophthalmologist in his practice
- Do refraction, contact lens fitting and orthoptic assessment independently
- Involve and do special investigative procedures
- To operate and maintain Ophthalmic instruments
- To maintain Ophthalmic theatre and Operating Instruments
- To run and establish an Optical shop

#### **ENTRANCE REQUIREMENTS**

Candidates for admission to the course shall have passed the Pre-Degree examination of the Kerala University or any other examination equivalent thereto, recognized by the Kerala University with 50% marks in Science subjects Group II in Physics, Chemistry and Biology with usual relaxation allowed by Government of Kerala for Scheduled Castes, Scheduled Tribes and Other Backward Classes.

#### **COURSE OF STUDY**

The course shall comprise of the theoretical and practical studies in different branches of Optometry and its related subjects.

#### **DURATION OF THE COURSE**

The duration of the course shall be 3 (three) years. Approximately 250 working days in an year with a minimum of 6 hours per day which works approximately 1450 working hours per year. After the 3<sup>rd</sup> year, they have to do a compulsory rotating internship in various specialty departments for one year.

### **FIRST YEAR**

#### **First Semester (6months)**

<u>Subjects</u>	<u>Type of Examination</u>
1. English	Internal Assessment
2. Physics	“
3. Chemistry	“
4. Mathematics	Internal Assessment only
5. General Anatomy	“

6) General Physiology “

### **Second Semester**

<u>Subjects</u>	<u>Type of Examination</u>
1. English	University Exam
2. Physics	“
3. Chemistry	“
4. General Anatomy	“
5. General Physiology	

Ocular anatomy & ocular physiology will be dealt as separate paper in 2nd year

## **SECOND YEAR**

### **Third semester**

<u>Subjects</u>	<u>Type of Examination</u>
1. Information Technology	Internal Assessment Only
2. Nutrition & Biochemistry	Internal Assessment
3. Microbiology	“
4. Pathology	
5. Ocular Anatomy	
6. Ocular Physiology	“
7. Optometric Optics	“
8. Clinical Examination of Visual System & Instruments	“
9. Visual Optics	“

CLINICS – 18 hours / week

### **Fourth Semester**

<u>Subjects</u>	<u>Type of Examination</u>
1. Optometric Optics	University Examination
2. Clinical Examination of Visual Systems & Instruments	“
3. Visual Optics	“
4. Nutrition & Biochemistry	“
5. Microbiology and Pathology ( Part A & part B)	
6. Ocular anatomy and Physiology( Part A & part B)	“

CLINICS – 20 hours / week

## THIRD YEAR

### Fifth Semester

Subjects	Type of Examination
1. Pharmacology	Internal Assessment
2. Systemic Diseases Medicine	“
3. Eye Diseases	“
4. Dispensing Optics & Mechanical Optics Contact Lens & Low Vision aid	“
5. Binocular Vision & Squint	“
6. Community Ophthalmology	“

CLINICS & PROJECTS – 20 hours / week

### Sixth Semester

<u>Subjects</u>	<u>Type of Examination</u>
1. Eye Diseases & Systemic Diseases	University Exam
2. Dispensing Optic, Mechanical Optics Contact Lens & Low Vision Aids	“
3. Binocular Vision & Squint	“
4. Community Ophthalmology	“
5. Project	“
6. Pharmacology	“

CLINICS & PROJECT 20 hours/week

## FOURTH YEAR

The project work will be in the training period

There will be 2 projects

Project 1 will be scientific study

**Project 2 will be a community based study.**

### **Specialty training**

One month each in the following specialities in the

### **Seventh Semester**

1. Ophthalmic Theatre Techniques
2. Refraction and Contact Lenses
3. Mechanical Optics
4. Paediatric Ophthalmology & Orthoptics
5. Community Ophthalmology
6. Ophthalmic Instrumentation Photography (Advanced & Basic)

### **Eighth Semester**

Six months special training in one of the above branches of preference based on merit.

### **REQUIREMENT OF ATTENDANCE**

A candidate will be permitted to appear for University Examination in any subject only if he/she secured not less than 80% attendance which is also required at the postings to clinics.

### **SCHEME OF STUDY**

In addition to practical training in the Department of Optometry, the students will be posted to the departments of Anatomy, Physiology, Physics, Microbiology and Optical workshop attached to Ophthalmic clinics. Besides practical classes, the training in Optical work should be given in clinics, with the candidate taking active part in the routine work of the out-patient department.

Internal assessment will be conducted at the end of each posting and the marks will be handed over to the Course Director for B.Sc. (OPT) for inclusion in the final assessment of the candidate.

### **VACATION/HOLIDAYS**

The students will be permitted to avail holidays and vacations as scheduled below:

Onam Holidays	-	7 days
Christmas Holidays	-	7 days
May vacation	-	1 month

### **SESSIONAL MARKS**

Sessional marks will be awarded to the candidates in each subjects of study as detailed in the scheme of examination. The award shall be on the basis of the assessment made by the teachers from the candidate's performance in the assignments, class tests, Optical shop work, record work etc. The marks secured by the candidates during each year shall be forwarded to the University at the end of the year, before the commencement of the written examination.

**SCHEME OF EXAMINATION**

There shall be University Examinations at the end of all 3 years as scheduled below.

**FIRST YEAR EXAMINATION**

A candidate shall be declared to have passed the first year examination, if he/she secured the minimum marks specified below in the following subjects:

**First Semester**

	Internal Assessment Only
1. English	20
2. Physics	20
3. Chemistry	20
4. General Anatomy	20
5. General Physiology	20
6. Mathematics	40
<b>Total</b>	<b>160</b>

**Second Semester (UNIVERSITY EXAMINATION)**

Sl. No.	Subjects	Internal Assessment of 1 <sup>st</sup> Semester	Max:Marks	Min:Marks	Duration (Hours)
1	English	20	80	50	2
2	Physics	20	80	50	2
3	Chemistry	20	80	50	2
6	General Anatomy	20	80	50	2
7	General Physiology	20	80	50	2
	<b>Total</b>	<b>160</b>	<b>480</b>	<b>300</b>	

## SECOND YEAR EXAMINATION

A candidate shall have declared to have passed the second year examination, if he/she secures the minimum marks specified below in the following subjects :

### Third Semester

	Internal Assessment Only
1. Information Technology	40
2. Nutrition & Biochemistry	20
3. Microbiology	20
4. Pathology	20
5. Optometric Optics	}
6. Clinical Examination of Visual System & Instruments	
7. Visual Optics	
8. Ocular Anatomy and Physiology	20+20
<b>Total</b>	<b>200</b>

### Fourth Semester University examination

Sl. No.	Subjects	Internal Assessment of 3 <sup>rd</sup> Semester	Max:Marks	Min:Marks	Duration (Hours)
1.	Optometric Optics *	} 60	80	50	2
2.	Clinical Examination of Visual Systems & Instruments *		80	50	2
3.	Visual Optics		80	50	2
4.	Nutrition Biochemistry	20	80	50	2
5.	Microbiology & Pathology	10 ] 10 ]	80	50	2
6.	Ocular Anatomy and Physiology	10+10	80	50	
	<b>Total</b>		<b>600</b>	<b>300</b>	

## THIRD YEAR EXAMINATION

A candidate shall be declared to have passed the third year examination if he/she secures the minimum marks specified below in the following subjects :

### Fifth Semester

		Internal Assessment Only	
1.	Pharmacology	20	
2.	Systemic Diseases Medicine *	20	
3.	Eye Diseases *	Page 8 + 9 III <sup>rd</sup> year core subjects	
4.	Dispensing Optics & Mechanical Optics Contact Lens & Low Vision aid *		
5.	Binocular Vision & Squint *		
6.	Community Ophthalmology *		
<b>Total</b>			

### Sixth Semester

Sl. No.	Subjects	Internal Assessment	Max:Marks	Min:Marks	Duration (Hours)
1.	Eye Diseases and Systematic Diseases *				Page 9 III <sup>rd</sup> year core subjects
2.	Dispensing Optics & Mechanical Optics Contact Lens & Low Vision aid				
3.	Binocular Vision & Squint *	20	80	50	2
4.	Community Ophthalmology *				
5.	Pharmacology				



## UNIVERSITY EXAMINATION – 2<sup>nd</sup> YEAR

	Max: Marks	Mini: Marks	Duration
1. *Optometric Optics	100		
Sessionals	50	75	3 hrs.
Practical + Viva	100		
Sessional	50	75	4 hrs
	<b>300</b>	<b>150</b>	
2. *Clinical Examination of Visual System & Instruments	100		
Sessional	50	75	3 hrs.
Practical + Viva	100		
Sessional	50	75	4 hrs
	<b>300</b>	<b>150</b>	
3. *Visual Optics	100		
Sessional	50	75	3 hrs.
Practical + Viva	100		
Sessional	50	75	4 hrs.
	<b>300</b>	<b>150</b>	
	<b>900</b>	<b>450</b>	

## UNIVERSITY EXAMINATION – 3<sup>rd</sup> YEAR

	Max: Marks	Mini: Marks	Duration
1. *Eye Diseases + Systemic disease	100		
Sessionals	50	75	3 hrs.
Practical + Viva	100		
Sessional	50	75	4 hrs
	<b>300</b>	<b>150</b>	

2. *Dispensing optics, Mechanical Optics			
Contact lens, Low visual aids	100		
Sessional	50	75	3 hrs.
Practical + Viva	100		
Sessional	50	75	4 hrs
	<b>300</b>	<b>150</b>	
3. *Binocular Vision + Squint	100		
Sessional	50	75	3 hrs.
Practical + Viva	100		
Sessional	50	75	4 hrs.
	<b>300</b>	<b>150</b>	
4. * Community Ophthalmology	100		
Sessional	50	75	3 hrs.
Practical + Viva	100		
Sessional	50	75	4 hrs.
	<b>300</b>	<b>150</b>	
5. * Project	100	50	
	<b>1300</b>	<b>650</b>	

## **SUPPLEMENTARY EXAMINATION**

### **There will be no supplementary examination**

Those failing in any one of the subjects need reappear only in that subject.

They can write the examination the next year.

Those failed in the 3 year subject/subjects will have to reappear for minimum 2 months postings in each of the failed subject, before appearing for the University examination in those subject/subjects.

## **EXAMINERS**

There shall be two examiners – One Internal and External. The External examiners shall be drawn from a sister University in Kerala or Outside Kerala where a similar course is being conducted. Both External and Internal examiners should preferably be those who are full time teachers of Ophthalmic Institution or Ophthalmic Technical Institution.

The External examiners will have to hand over the original mark – lists to the Chairman (Course Director for B.Sc. OPT) and the duplicate mark – lists to the Controller of University Examinations.

## **B.Sc. OPTOMETRY COURSE**

### **TITLE OF THE SUBJECT**

#### **BASIC SCIENCE COURSE**

1. English
2. Physics
3. Chemistry
4. Mathematics
5. Anatomy
6. Physiology
  
7. Information Technology
8. Nutrition & Biochemistry
9. Microbiology
10. Pathology
11. Pharmacology

#### **CORE COURSES**

1. Optometric Optics
2. Clinical Examination of Visual Systems & Instruments
3. Visual Optics
4. Systemic Diseases Medicine
5. Eye Diseases
6. Dispensing Optics & Mechanical Optics Contact Lens & Low Vision aid
7. Binocular Vision & Squint
8. Community Ophthalmology
9. Project

### **BASIC SCIENCE COURSES**

#### **1. ENGLISH**

##### **Semester 1**

###### **I Grammar**

**Aim :** The study of grammar of functions, language skills and fluency. One ought to know the basic rules of the English language to use it effectively. Acquire a good knowledge of English – its grammatical rules.

### Topics for study

1. Verbs
2. The system of Tenses in English (Present, Past and Future – Tenses)
3. Voice – Active and Passive
4. Use of Articles
5. Prepositions
6. Question Tags
7. Correction of Sentences (Teaching Hours – 25)

II The Sounds of English : To introduce the students to the sound sense of the English language. For effective speech, the basic understanding of the sound system of English is essential.

1. Twenty distinct vowels. (Vowels & diphthongs)
2. Twenty four different consonants.  
All 44 phonetic symbols to be taught. The students should be able to transcribe monosyllabic words in International Phonetic Alphabet (IPA).
3. Word Accent – Importance of stress in English (only Primary stress for study)
4. Intonation - Rising and falling  
(This part is only to introduce to the students that each language has a different language system. In foreign language learning one tends to hear and speak on the basis of the system of one's own language. Therefore, one has to resist the pull of the mother tongue influence and adequately listen and learn the foreign language. (Teaching Hours – 10)

III Students should be able to use the English language to meet the requirements of day to day real life and academic activities. Hence a certain level of fluency of the system language is essential. This is to help the student use English effectively in a debate, discussion, job interview etc.

1. To speak on personal experiences, opinion and attitudes etc.  
Personal topics – like  
Your idea of friendship or What is your outlook in life?
2. Students often have to participate in group discussions and express themselves on topics of general interest.  
General topics – like – Tourism – Globalization – Medical ethics  
(This is mainly a speaking skill, and interactive class room work is required) For the examination this will be a written test wherein the students has to express himself in five clear sentences on any topic that is asked. (Teaching Hours – 10)

IV Language is used to perform communicative functions. Functions in English are a very important part of learning to speak the language : Hence dialogue is an important aspect of language learning.

1. Greeting – make a request – apologise or congratulate – ask for directions, etc.
2. Dialogue Writing – Simple situational conversation on everyday situations.  
(Interactive class room work is required) (Teaching Hours – 10)

- V The study of English language in this course should make the student aware that it enhances the subject of his study.  
Introduce the students to Medical Terms.
1. Terms in Ophthalmology
  2. Make the students write short reports – medical reports that an Optometrist would be required to write. (Teaching Hours – 5)
- VI Reading skill is very important. A student should be able to read at a speed of atleast 100 words per minute. Reading should focus on better comprehension. Comprehension is to grasp an idea or concept in its entirety.
- Aim :
1. To help the student read faster with better comprehension
  2. Grasp the meaning from the contexts
  3. Express what one has understood in appropriate words.
- Students ought to be trained to acquire study reading speed. Study reading speed aimed at total comprehension and retention of meaning.  
(Teaching Hours – 20)

TOTAL TEACHING HOURS : 80

**Books Prescribed for study :**

1. Functional Grammar and Spoken and Written Communication in English  
Bikram K. Das, Published by Orient Longman.
2. A course in Listening and Speaking I (with CD)  
V. Sasikumar, P.Kiranmai Dutt, Geetha Rajeevan – Published by Foundation Books

## 2. PHYSICS

### PHYSICAL OPTICS THEORY

#### 1. Nature of Light

- 1.1 Corpuscular Theory
- 1.2 Wave Theory
- 1.3 Simple Harmonic Motion – energy – composition of simple harmonic motion in a straight line and at right angles.
- 1.4 Huygen’s Principle – Laws of reflection and refraction at spherical surfaces and lenses.
- 1.5 Fermat’s Principle
- 1.6 Light – electromagnetic spectrum, Quantum Theory
- 1.7 The paraxial region
- 1.8 Ray and wave velocity

## 2. Interference

- 2.1 Coherence, Young's Experiment – intensity, path difference, phase difference – band width – white light fringes.
- 2.2 Thickness of a thin film – Lloyd's Single Mirror experiment. Phase change on reflection.
- 2.3 Colours of thin films, wedge shaped thin films. Testing of planeness of surfaces
- 2.4 Newton's Rings experiment, refractive index of liquid.
- 2.5 Non-reflecting films
- 2.6 Visibility of Fringes – width of spectral lines.

## 3. Diffraction (Fresnel and Fraunhofer classes)

- 3.1 Single slit, qualitative and quantitative
- 3.2 Circular aperture
- 3.3 Double slit pattern and Kirchoff's integra
- 3.4 Multile slits – grating, resolving power of grating, microscope, telescope, prism, lenses and eye – dispersive power
- 3.5 Reflection, grating and the zone plate Babinet's principle.

## 4. Polarization

- 4.1 Introduction
- 4.2 Brewster's Law, Malus Law – Double refraction, Principle plane, nicol prism – plane polarizarion
- 4.3 Circular polarization, elliptical polarization – production detection and behaviour, Babinet compensator.
- 4.4 Optical activity – Fresnel's explanations – specific rotation – half shade polarimeter.
- 4.5 Polarisation by selective absorption – Dichorism
- 4.6 Basic idea of Holography

## 5. Laser Optics

- 5.1 Coherence – spatial and temporal
- 5.2 Elementary Theory
- 5.3 Laser tube, or cavity – Optical pumping, resonators, Brewster's window
- 5.4 Solid and gas lasers (Ruby, YAG, Nd-glass; Helium – Neon, Argonion)
- 5.5 Pulsed Lasing
- 5.6 Lasers in Medicine

## 6. Spectrum

- 6.1 Production of spectrum by different methods
- 6.2 Measuring instruments
- 6.3 Visible, ultra violet and infra red spectra
- 6.4 Radiometry and phometry and spectroscopic instruments

## 7. Scattering

- 7.1 Rayleigh's scattering
- 7.2 Raman scattering

7.3 Elements of EM Theory in vector notation and propagation of a wave in an anisotropic medium

**8. Surface tension** : Elementary

**9. Viscosity** : Elementary

### **PHYSICAL OPTICS PRACTICAL**

1. Fresnel's biprism experiment
2. Thickness of thin glass plate
3. Newton's Rings – Radius of curvature
4. Newton's Rings – Refractive index of a liquid
5. Air wedge
6. Grating – wavelength determination
7. Dispersive power of a grating
8. Grating – minimum deviation
9. Reflection grating
10. Diffraction at a straight wire
11. Resolving power of a telescope
12. Polarimeter

### **GEOMETRICAL OPTICS – I THEORY**

#### **1. Photometry**

- 1.1 Definitions – Lambert's Law
- 1.2 Photometers – Lummer Brodhun flicker and photo voltaic
- 1.3 Reflection co-efficient, transmission co-efficient power – transmitted and reflected

#### **2. Refraction through spherical surfaces**

- 2.1 Fermat's Principle
- 2.2 Sign convention
- 2.3 Refraction at spherical surfaces – concave and convex lenses
- 2.4 Lagrange's Law, least possible distance between an object and real image
- 2.5 Combination of thin lenses
- 2.6 Cardinal points – nodal slide
- 2.7 Thick lenses
- 2.8 Matrix theory and lens matrices

#### **3. Aberrations**

- 3.1 Chromatic aberrations – dispersion without deviation and deviation without dispersion - application
- 3.2 Monochromatic aberrations – First Order Theory and Third Order Theory

- 3.3 Spherical aberration, Coma, Astigmatism, Curvature, Distortion – causes and the methods of minimizing the aberrations
- 3.4 Tangent condition for elimination of distortion
- 3.5 Computer programme for calculating system matrix and computerized lens design.
- 4. Fibre Optics**
- 5. Colour Theory Trichromatic colour measurement**

## **GEOMETRICAL OPTICS – II THEORY**

- 1. Introduction
  - 1.1 Power of a lens – addition and subtraction
  - 1.2 Prismatic powers – vector addition
  - 1.3 Cylindrical lens
- 2. Gullstrand's Schematic eyes, visual acuity, Stile Crawford experiment and Binocular telescopes
- 3. Emmetropia and Ametropia
- 4. Correction of spherical ametropia
- 5. Spectacle magnification
- 6. Presbyopia
- 7. Aphakia
- 8. Astigmatism
- 9. Contact lenses
- 10. A thin lens as a phase transformation – Fourier transforming properties of lenses.

## **GEOMETRICAL OPTICS – I PRACTICAL**

- 1. Refraction through a slab
- 2. Caustic curve for a glass slab
- 3. Refraction at a curved surface
- 4. I-d curve for a prism-pin method
- 5. Spherometer and lens gauge
- 6. Single optic lever
- 7. Double optic lever
- 8. Spherical mirrors
- 9. Spherical lenses
- 10. Critical angle – glass and water
- 11. Magnifying power of a simple and a compound microscope
- 12. Magnifying power of a telescope



## GEOMETRICAL OPTICS – II PRACTICAL

1. Spectrometer – minimum deviation
2. Spectrometer – I-d-curve
3. Spectrometer – I-I-curve
4. Spectrometer – narrow angled prism
5. Refractive index by microscope
6. Focimeter
7. Dispersive power of a prism
8. Toric lens and meniscus lens
9. Nodal slide
10. Boy's method – radius of curvature
11. Liquid lens
12. Refractive index of lenses

### 3. CHEMISTRY

#### General and Organic Chemistry (Theory)

1. Bonding in hydrocarbons and introduction to reaction mechanism:  
 Hybridisation involving s and p orbitals, geometry of methane, ethane, ethene, ethyne and benzene  
 Electron displacement in a covalent bond, inductive effect, electromeric effect, resonance and hyperconjugation. Fission of a covalent bond, free radicals, Carbocations, Carbanions, Electrophiles and Nucleophiles. Substitution, addition, elimination and rearrangement reactions – illustration with examples.
2. Stereoisomerism:  
 Causes of optical activity, optically active compounds (lactic and tartaric acid), enantiomers, diastereoisomers, racemisation, resolution.  
 Geometrical isomerism (maleic and fumaric acids). Keto – enol tautomerism.
3. Aromatic Compounds:  
 Benzene : isolation and uses. Properties of benzene : alkylation, acylation, nitration, halogenation and sulphonation.
4. Carbohydrates:  
 Mono – di – and poly saccharides, examples. Preparation and reactions of glucose, fructose and sucrose.  
 Sources of starch and cellulose, their uses.
5. Chemotherapy:  
 Preparation and uses of sulpha drugs. Structure and uses of penicillin and chloramphenicol.  
 Vitamins and Hormones : Structure and biological activities of Vitamin A, B<sub>1</sub>, B<sub>12</sub>, and C (Elucidation of structure not included). Classification and functions of hormones.

6. Colloids, Chromatography and buffers:  
 Emulsions : Preparation, properties and applications.  
 Principle of column, paper and thin layer chromatography – applications.  
 Buffer action, pH of buffer in living systems, determination of pH by  
 colourimetric and electrometric methods.

## 4. MATHEMATICS

### Trigonometry (10 hours)

Trigonometric Functions of sum and difference. Trigonometric Functions of multiples and submultiples. Inverse Trigonometric functions. Review of complex numbers – Evaluation of roots of complex numbers –  $n^{\text{th}}$  roots of unity – properties – Expansion of multiples and powers of trigonometric functions.

### Calculus (15 hours)

Differentiation of algebraic and Trigonometric functions – Function of a Function – simple problems. Successive differentiation. Radius of curvature. Integration of algebraic and trigonometric functions – Integration by substitution and by parts – Definite Integrals. Fourier series – Laplace transformations.

### Algebra (15 hours)

Logarithms, common and Napierian, Partial Fractions – statements of Binomial Exponential and Logarithmic theorems – Use of these in summation and Approximations – Roots of an Equation – Relations connecting roots and Coefficients.

Basic biostatistics will be taught in order to enable the students to complete project work

### Reference Books:

1. Trigonometry by Dr. R.S. Varma and Dr. K.S. Shukla
2. Trigonometry by S.Lonery
3. Differential calculus by Santhi Narayan
4. Calculus by Manica Vachakom Pillai and Natarajan
5. Algebra by Manica Vachakom Pillai
6. NCERT Mathematics Textbooks for class XI and class XII

## 5. ANATOMY

### I. General Anatomy

- |                                    |   |        |
|------------------------------------|---|--------|
| a. Terms and subdivisions          | – | 1 hr.  |
| b. Epithelium and glandular tissue | – | 3 hrs. |
| c. Connective tissue               | – | 2 hrs. |
| d. Cartilage                       | – | 1 hr.  |
| e. Bone and joints                 | – | 3 hrs. |
| f. Lymphatic tissue                | – | 2 hrs. |
| g. Nervous tissue                  | – | 1 hr.  |
| h. Vascular tissue                 | – | 1 hr.  |

i. Muscular tissue	–	1 hr.
j. Skin and appendages	–	1 hr.
k. Slide demonstration	–	11 hrs.
<b>TOTAL HOURS</b>	<b>:</b>	<b>30 Hours</b>

## II. Systemic Anatomy

a. CVS	-	3 hrs.
b. Respiratory	-	3 hrs.
c. GIT	-	5 hrs.
d. Lymphatic	-	2 hrs.
e. Endocrine	-	2 hrs.
f. CNS	-	3 hrs.
g. ANS	-	2 hrs.
h. Musculoskeletal	-	5 hrs.
Demonstration	-	10 hrs.
<b>TOTAL HOURS : 25 + 10</b>	<b>-</b>	<b>35 hrs.</b>

## III. Ocular Anatomy

a. Eye – detailed		15 hrs
b. Neuro ophthalmology	-	5 hrs.
c. Development	-	5 hrs.
<b>TOTAL HOURS</b>	<b>:</b>	<b>25 hrs.</b>

## 6. PHYSIOLOGY

Total Number of Hours	:	100 Hours
Theory	:	90 Hours
Practicals	:	10 Hours

Details

<b>I. HAEMATOLOGY</b>	<b>12 hrs.</b>
Introduction, Composition & function of blood, specific gravity, Viscosity Plasmaproteins	1 hr.
<b>Red Blood Cells</b> Structure, Normal count, Variations, Properties Haemoglobin – normal value, Variations, Structure Abnormal Hbs, Erythropoiesis, Factors affecting – Anemia – classification, details of various types of Anemia.	4 hrs.
<b>White Blood Cells</b> Morphology, Normal total count, differential count, Variations, Properties and Functions, Leucopoiesis, Factors affecting.	2 hrs.
<b>Platelets</b> Morphology, Normal count, Variations, Functions of Platelets, Hemostasis – Details, Thrombopoiesis	1 hr.

	<b>Coagulation of Blood</b>	
	Clotting factors, Intrinsic & Extrinsic mechanisms, Defects in Coagulation, Bleeding time, Clotting time, Anticlotting mechanisms in the body, Anticoagulants	2 hrs.
	<b>Blood Groups</b>	
	ABO system, Landsteiner's laws, Importance of cross matching, Blood transfusion, complications of mismatched blood transfusion, Rh system, Rh incompatibility	1 hr.
	<b>Blood Volume</b>	
	Normal Value, Variations, one method for estimating blood volume, Lymph, Composition, Functions & Formation of Lymph. Starling's hypothesis of tissue Fluid formation, Edema	1 hr.
<b>II.</b>	<b>CARDIO VASCULAR PHYSIOLOGY</b>	<b>10 hrs.</b>
	Functional anatomy, conducting system of heart origin & conduction of Impulses	1 hr.
	Cardiac cycle, Various phases, heart sounds ECG	2 hrs.
	<b>Cardiac Output</b>	
	Definition normal values variations, Regulation of stroke volume – Homometric – heterometric, One method to meas Cardiac output	2 hrs.
	<b>Heart Rate</b>	
	Normal value, Variations, regulation of heart rate	1 hr.
	<b>Arterial Pulse</b>	
	<b>Blood Pressure</b>	
	Definition, Normal, Value variations, Determinations of Blood pressure, Estimation of Blood pressure, Regulation of Blood pressure, Shock, Compensatory mechanisms in shock	3 hrs.
	<b>Regional Circulation</b>	
	Coronary Circulation, Pulmonary Circulation, Cutaneous circulation, Cerebral circulation	1 hr.
<b>III.</b>	<b>RESPIRATORY SYSTEM</b>	<b>8 hrs</b>
	Introduction, Functional anatomy, Respiratory muscles and their actions During Ventilation	1 hr.
	Intrapleural pressure, Intrapulmonary pressure, Pressure changes during Respiratory cycle, Lung volumes & Capacities	1 hr.

Respiratory dead space, Pulmonary circulation, Gas exchange across the Respiratory membrane, Factors affecting diffusion	1 hr.
O <sub>2</sub> transport through blood, Oxygen dissociation Curve, Factors shifting the ODC to right & left	1 hr.
Carbondioxide transport	1 hr.
Regulation of respiration, a) Neural, b) Chemical, Abnormalities in regulation, Hypoxia, Hypercapnoea Cyanosis, Asphyxia	2 hrs.
Changes in Barometric pressure in respiration, Exercise Physiology, Artificial Respiration	1 hr.
<b>IV. GASTROINTESTINAL SYSTEM</b>	<b>8 hrs.</b>
Functional anatomy, Enteric nervous system, Salivary secretion, Innervation of Salivary glands, Composition & functions of Saliva, Regulation of secretion	2 hrs.
<b>Gastric secretion</b> Gastic glands, Composition & functions of pancreatic juice. Regulation, Hydrochloric acid secretion, factors affecting, Peptic ulcer	1 hr.
<b>Pancreatic secretion</b> Functional anatomy, composition & functions of pancreatic juice. Regulation of pancreatic secretion	1 hr.
<b>Liver</b> Functional anatomy, composition & functions of Bile regulation of secretion. Bile salts, Bile pigments, Enterophepatic circulation, Jaundice, Functions of gall Bladder	1 hr.
<b>Movements of GIT</b> Mastication, Deglutition – stages, Gastric movements, Small intestinal movements, small intestinal movements, Abnormalities	2 hrs.
Movements of large intestine Defecation reflex, Abnormalities	1 hr.
Digestion & absortion of Carbohydrates, Proteins & fat	1 hr.
<b>V. RENAL PHYSIOLOGY</b>	<b>5 hrs.</b>
Functional anatomy – Nephron, Renal blood flow, Glomerular filtration, Factors affecting GFR	1 hr.

Tubular function	1 hr.
Concentration of Urine	1 hr.
Acidification of Urine	1 hr.
<b>Urinary Bladder</b>	
Innervation, Mictarition reflex, Cystometrogram, Abnormalities	1 hr.
<b>VI. PHYSIOLOGY OF CENTRAL NERVOUS SYSTEM</b>	<b>15 hrs.</b>
<b>Sensory System</b>	
Organisation of nervous system, Funtional anatomy, Synapse, Synaptic Transmission, Synaptic inhibition, Properties of Synapse	1 hr.
Reflex action – components, Properties, Mono synaptic & Poly synaptic Reflexes, Stretch reflex, Inverse stretch reflex, Receptors – types of Receptors, Receptors potential	1 hr.
Pathways of sensations from body & face	2 hrs.
Pain – referred pain, control of pain	1 hr.
<b>Thalamus</b>	
Functional anatomy, connections & functions, Thalamic Syndrome	1 hr.
<b>Motor System</b>	
Functional anatomy, Pyramidal tract, Lesions, Differences between upper Motor & Lower motor neuron lesions	2 hrs.
<b>Basal Ganglia</b>	
Functional anatomy, connections & functions, Parkinsonism	1 hr.
<b>Cerebellum</b>	
Gross structure, Histology, connections & functions, Cerebellar lesion	1 hr.
<b>Limbic System</b>	
Connections & Functions	1 hr.
Reticular formation – connections functions, Ascending Reticular Activating System	1 hr.
<b>Vertibular apparatus</b>	
Functional anatomy receptors, Connections & Functions	1 hr.

**Cerebral Cortex**

Brodmanns areas, functions,

Higher functions – Speech  
Learning

Sleep &amp; EEG Memory

Hypothalamus - Connections &amp; Functions, Postural reflexes 1 hr.

**VII. SPECIAL SENSES 14 hrs.****Olfaction**

Olfactory mucosa, Olfactory receptors, Olfactory pathway 1 hr.

**Taste**

Receptors – Primary sensations of taste, Gustatory pathway 1 hr.

**Audition**Functional anatomy, functions of middle ear, structure of  
Cochlea, Auditory Pathway, Deafness, Endocochlear potentials 2 hrs.**Vision**Functional anatomy of the eye, Optical systems of the eye,  
Physiology of Optics 1 hr.

Near response, Accommodation 1 hr.

Refractive errors, Visual Acuity, Measurement of visual  
acuity, Field of Vision, Measurement 1 hr.**Visual Sensation**Receptors – Structure, Photochemistry of vision,  
Role of Vitamin A in Vision, Sensitivity of Retina to  
various degree of Illumination. Dark and Light  
adaptations, Electrophysiology of vision 2 hrs.Pathways for vision, Pathways for pupillary Reflexes,  
Pathways for accommodation 1 ½ hrs.

Cortical representations, Lesions of Optic Pathways 1 hr.

Colour Vision – Latest View, Colour blindness,  
Tests for colour vision 1 ½ hrs.**VIII. ENDOCRINOLOGY 10 hrs.**Endocrine glands in human body. Hormone – definition,  
Second messengers, Radiomunossay of hormones,  
Anterior pituitary gland, Hormones secreted 1 hr.

Growth hormone, actions, conditions in which the hormone secretion is affected, regulation. Other hormones secreted, target organs	1 hr.
<b>Posterior Pituitary</b> - Hormones, Actions Neuroendocrine Reflexes	1 hr.
<b>Thyroid Gland</b> - Hormones secreted synthesis, actions, Regulation of secretion clinical abnormalities	2 hrs.
Hormones regulating blood calcium level, Para Hormone, Calatonin, 1-25 di OH Chole calciferol	1 hr.
<b>Adrenal Cortex</b> Hormones, Biosynthesis, Actions, Regulations, Clinical abnormalities	1 hr.
<b>Adrenal Medulla</b> Hormones, Biosynthesis, Actions, Clinical abnormalities	1 hr.
<b>Endocrine Pancreas</b> Histology, Hormones – Insulin, Glucagon, Actions, regulation of secretion, Clinical abnormalities	1 hr.
<b>Pineal Gland</b> – Local hormones	1 hr.
<b>IX. TEMPERATURE REGULATION, CSF, ANS etc..</b>	<b>2 hrs.</b>
<b>Practicals :</b>	<b>Total</b>
	Demonstrations Only
1. The Compound Microscope	
2. Microscopic Examination of blood	
3. Erythrocyte Sedimentation Rate	
4. Packed Cell Volume	
5. Osmotic Fragility	
6. Estimation of Haemoglobin	
7. Enumeration of Red Blood Cells	
8. Enumeration of White Blood Cells	
9. Differential Count	
10. Determination of Blood Group	
11. Determination of Bleeding Time & Clotting Time	
12. Measurement of Arterial Blood Pressure in man	
13. Perimetry	
<b>Ocular Physiology</b> Physiology of vision	3 hrs



Accommodation        3 hrs  
 Binocular Vision and ocular motility    10 hrs  
 Total        16 hrs

## 7. INFORMATION TECHNOLOGY

### Module 1:

Functional Introduction to IT – Personal Computers – Functional Parts – CPU, Input and Output Devices – RAM and ROM – Software & Hardware – PC specifications – Networking of computers (General Information Only) – Internet – Services over the Internet – E-mail, www, FTP, etc, Search Engines, Programming Languages – Concepts of low level and High level Languages. Types of Computers – PC, Laptops, Palmtops etc.

### Module 2:

Operating systems – Definition – Functions of Operating Systems – Examples of GUI based operating systems – windows and linux. Basic operating system commands – creating and managing files and folders – managing desktop – basic utilities – viruses and antiviruses.

### Module 3:

Application softwares – Office packages (Microsoft Office/Open Office) – Word processing – spread sheets, presentation softwares – Data Bases – Generic features only – Popular Browsers (Generic features only) – Image Processing packages – general features only.

### Text Books

1. D'souza & D'souza, Learn computers step by step, Person Education
2. Leon, Introduction to IT, Leon Tech Publishers.

### References

1. Peter Nroton, "Introduction to computers", Tata Mc Graw Hill
2. Swarup K.Das, "A text book of Information Technology". Dominant Publishers, New Delhi.

## 10. NUTRITION & BIOCHEMISTRY

### General Biochemistry, Ocular Biochemistry & Nutrition

Total Hours	-	70
Theory	-	60
Practicals	-	10

### THEORY

- I. Introduction - 1Hour
- II. Carbohydrates - 12 hours  
Chemistry  
Glycolysis, HMP shunt pathway; Galctose & Fructose metabolism, Glycogen metabolism; Glycogen storage diseases, TCA cycle, Glycosaminoglycans, Blood sugar and its regulation, GTT; Diabetes mellitus
- III. Proteins - 10 hours  
Chemistry Functions, Essential Amino acids, Plasma Proteins, Immunoglobulins, Complete and Incomplete Proteins; Supplementary food, PEM and Eye; Quality of proteins, Nitrogen Balance, Urea cycle, Metabolism of amino acids – Sulphur containing amino acids & Tyr.
- IV. Lipids – 7 hours  
Classification, Essential fatty acids, Beta oxidation, Fatty acid synthesis, Ketosis, Excess and deficiency – Lipids & Eye, Hyperlipidemias – diseases – Atherosclerosis, Lipoproteins; Prostaglandins.
- V. Enzymes – 3hours  
Classification – Factors affecting enzyme action – Enzyme inhibition, Clinically important enzymes.
- VI. Nutrition – 4 hours  
Energy metabolism – units of energy, Energy value of food, Malnutrition, Balanced diet, Calorie requirement at different age groups, RDA; Alternative food pattern.
- VII. Vitamins – 7hours  
Vitamin A, Its role in vision & Regulatory mechanisms of Ophthalmologically important vitamins, Vitamin D & K, Vitamin E, Free radicals and antioxidants, B complex vitamins, Vitamin C.
- VIII. Minerals – 3 hours  
Macrominerals (1 hr), Microminerals (2 hrs), Fe, Cu, Se, Zn, I
- IX. Hemoglobin  
Heme – synthesis & catabolism (Mention only), Disorders of synthesis – Prophyrias, Jaundice.
- X. Protein Synthesis and mutation (Mention Only) – 1 hour
- XI. Buffers, pH of blood, Acid base balance – 1 hour
- XII. Miscellaneous – 3 hours  
Low Birth Weight, Dietary toxins, Alcohol metabolism; Methanol poisoning, Measles and associated eye disorders, Green leafy vegetables, Dietary fibre.
- XIII. Ocular Biochemistry – 6 hours
  1. Importance of ocular biochemistry in ophthalmic practice

2. Tear film – composition –lipid layer – aqueous layer – mucoid layer – functions dysfunctions – tear substitutes.
3. Cornea – biochemical composition – corneal metabolism – nutrient uptake – transparency – irrigating solutions – aging – recent developments.
4. Lens – composition – metabolism – transparency – cataract formation , sugar cataracts and medical therapy – recent developments.
5. Aqueous humor – IOP and glaucoma
6. Vitreous humor – intraocular gels.
7. Retina – structure – composition – photoreceptor cell – metabolism and functions – phagocytosis – Retinal neurochemistry – Monoamines – acetylcholine – GABA – amino acids – taurine – neuropeptides – Biochemical correlates of retinal diseases.

## **PRACTICALS**

1. Abnormal constituents of urine – 4 hrs
2. Estimation of sugar and protein (demonstration) – 2 hrs
3. Electrophoresis & Chromatography (demonstration) – 2 hrs
4. Preparation of Phosphate buffer, phosphate buffered saline – 2 hrs

### **Reference book**

1. Review of biochemistry (Harper)
2. Textbook of Biochemistry (Dr.M.Vasudevan & Dr.Sreekumari)
3. Textbook of Biochemistry (Thomas.M. Delvin)
4. Human nutrition & Dietetics (Gallon, James, Ralph 10<sup>th</sup> editing)

## **STAFF**

Regular staff only – no guest faculty

**Teaching staff** - HOD with MBBS, MD (Biochemistry) to head the department. 2 teaching faculty –with MB Biochemistry or PG degree in Optometry with 3 years of teaching experience.

**Non- teaching staff** -

Lab Technician	1
JLA	1
Class IV	1

## **POSTS REQUIRED**

### **OPTOMETRIST**

2 Senior Full time Optometrist  
 M.Sc. Optometry or B.Sc. Optometry & 5 year teaching experience  
 2 Junior Optometrist  
 B.Sc. Optometry  
 2 Ophthalmic Assistants  
 Diploma in Ophthalmic Assistants

### **OPHTHALMOLOGIST**

1 - Professor to Head of the Department, M.A. Ophthalmology  
 1 - Associate Professor, M.S. Ophthalmology  
 1 - Assistant Professor, M.S. Ophthalmology  
 2 - Senior Lecturer M.S. Ophthalmology

## **OTHER FACILITIES**

**Staff room** - HOD -1 (Toilet attached  
 Teaching Staff room -1  
 Lab Staff room - 1  
 Rest room – 1  
 Lecture hall with AV support  
 Seminar room with AV support

**Laboratory** - 150 x 150 feet: with attached preparation room & adequate lighting, Work benches, gas connection, racks and sinks with water supply. Colorimeter, apparatus for electrophoresis & chromatography. Test tubes and appropriate glasswares : necessary chemicals.

## **EXAMINATION**

Internal Assessment - 20 marks.  
 University Examination - 80 marks  
 Total - 100 marks  
 Minimum marks for pass - 50%  
 (Separate minimum of 45 % for University exam is compulsory)

First class - 65 %  
 Distinction - 75 %  
 (First class & Distinction will be awarded only for the first attempt)

80 % attendance is mandatory for appearing for the examination  
 3 Sessional examinations (At least one in the University model)

University exam is to be conducted at the end of 1 year and results to be published before the students join the third semester. Carry over may be permitted.

### **Question paper – Format**

Answer all questions (Time : 2.30 hrs)

I.	Essays	2 x 15 marks =	30 marks
II.	Shorts Answers	5 x 15 marks =	25 marks
III.	Very short Answers	10 x 2 marks =	20 marks.
IV.	One word /fill in the blanks	5 x 1 mark =	5 marks.
	<b>Total</b>	<b>=</b>	<b>80 marks.</b>

## **11. MICROBIOLOGY**

At the end of the course, the student should:-

- a) Acquire knowledge of the different organisms that infect the human eye.
- b) Acquire the skill to use the basic methods of sterilization and disinfection in his day work and interpret Microbiology culture reports from the laboratory.
- c) Be motivated to use the acquired knowledge and skill to prevent microbial diseases of the eye, connected with optometric used in the eye.

### **Syllabus with Schedule of teaching**

Lectures	-	55 hrs
Demonstration	-	5 hrs
Total	-	60 hrs

#### **1. Introduction and General Microbiology – 10 hrs**

##### **To include:**

Morphology and physiology of Bacteria, Culture media and methods in identification of bacteria, antibiotic sensitivity testing and rational of use, sterilization and disinfection – Basic principles and application in optometry, infection and epidemiology of infectious diseases

#### **2. Immunology – 5 hrs**

**To Include :** Antigen, antibody, Structure and function of immune system, routine serological tests, Hypersensitivity, autoimmune diseases affecting the eye

### **3. Systematic Bacteriology – 15 hrs**

**To Include :** All gram – positive cocci and gram- negative cocci, gram-positive bacilli – Corynebacterium diphtheriae, Clostridia, Bacillus, Actinomyces and Nocardia, gram-negative bacilli – Enterobacteriaceae, Pseudomonas, Hemophilus, Mycobacteria,

### **4. Virology – 10 hrs.**

**To include :** Introduction with morphology and microscopy, modes of transmission and cultivation, Herpes, Pox, Adeno, Papova, Paramyxo, Picorna, HIV, Hepatitis, Applied Virology.

### **5. Mycology – 4 hrs.**

**To include :** Fungi that infect skin and superficial tissues, subcutaneous mycoses, opportunistic mycoses, antifungals used in the eye.

### **6. Parasitology & Entomology – 6 hrs.**

**To include :** Introduction and modes of spread, ampebae with special reference to free living amoebae, toxoplasmosis, filariasis and ocular filariasis, scabies, head and body lice.

### **7. Applied Microbiology – 5 hrs.**

**To include :** Specimen collection from eye and adnexa, lab diagnosis of common bacterial and viral infections of the eye, Lab diagnosis of fungal and parasitic diseases of the eye.

Demonstration

Morphology and culture media, Instruments used in sterilization and their working, Use of common disinfectants and waste disposal, Lab diagnosis of eye infections – Using isolates from the hospital lab.

#### **Laboratory Facilities:**

Microscopes - Mono Ocular - One for each student  
Binocular – 4 – for demonstration

Culture media and instruments used for sterilization/disinfections may be borrowed from the hospital lab or demonstration may be conducted in the hospital by arranging visit to sterile department and wards.

Teaching Aids

Overhead Projector - 1

OHP Paper and Pens

LCD Projector and Computer (Common for all classes)

White board with pens in Practical Hall.

#### **Examinations**

- Schedule – Two sessional exams at the end of third month and fifth month.  
1<sup>st</sup> sessional – Include General Microbiology, Immunology, Virology and Systemic bacteriology

2<sup>nd</sup> sessional – All topics

Internal assessment – Average of the two sessionals – 30 marks

Attendance – Separate 80% attendance for practical demonstration to be insisted.

**Prescribed Books:**

1. Greenwood. D, Slack RCB, Peuthere JF, Medical Microbiology 15<sup>th</sup> Edition 2000; Churchill Livingstone ELBS Edition.

**Reference Books:**

2. Immunology (National Medical Series: Hyde RM. B.I. Waverly Pvt. Ltd.
3. Textbook of Parasitology. C.K. Jayaram Panicker, 4<sup>th</sup> Edition.

## 12. PATHOLOGY

**a) AIM**

Aim of teaching Pathology for B.Sc. Optometry students is to provide the students with a comprehensive knowledge of the mechanism and cause of disease process, in order to enable him/her to achieve an understanding of the natural history and clinical manifestation of the disease.

**1. OBJECTIVE**

**a) Knowledge**

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

- i. Describe the mechanism of cell death, the degeneration, cellular adaption, patterns of tissue response to cellular injury and repair and be able to correlate structural and functional alternations.
- ii. Explain the Pathophysiological processes which govern the maintenance the Homeostasis, Mechanism of their disturbance and morphological and clinical Manifestations associated with
- iii. Describe the aetopathogenesis and morphological changes of common infections and neoplastic processes.
- iv. Describe the pathological findings on common ocular diseases.

**b) Skill**

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

Describe the rationale and principle of technical procedures of routine laboratory tests and Interpretations of the results.

**c) Integration**

At the end of the training he/she shall be able to integrate the cause of disease and relationship of different etiological factors that contribute to the natural history of common diseases.

**2. DETAILED SYLLABUS**

Duration of the course	-	1 Semester during Second Year (Six months)
Number of hours per week	-	3
Total number of Lectures	-	40 hrs.

Number of hours for practical Demonstration - 2 x 5	-	10 hrs.
<b>Total</b>	-	<b>50 hrs.</b>

### **SYLLABUS OF THEORY CLASSES**

<b>Topic</b>	<b>Hours</b>
Introduction and Etiology	1
Degeneration, Apoptosis, Disturbances of metabolism	3
Inflammation and repair	4
Circulatory disturbances	5
Shock	
Oedema	
Thrombosis	
Embolism	
Infraction	
Acute bacterial infection	1
Specific Infection	5
Tuberculosis	
Leprosy	
Fungal Infection	
Viral, Chlamydial Infection	
Neoplasia	5
Definitions	
Classifications	
Behaviour of benign and Malignant Neoplasm	
Spread of Tumours	
Etiopathogenesis	
Diagnostic methods	
Haematology	
Introduction and RBC disorders	2
WBC disorders, Plasma cell dyscrasia	2
Bleeding and coagulation disease	2
Clinical Pathology	
Introduction	
Functioning of laboratory	1
Collection of blood sample	
Haematology Technique	1
Examination of Urine	1
Ocular Pathology	7



Infection  
 Degenerative conditions  
 Ocular manifestation in systemic disease  
 Cataract  
 Tumours

## 13. PHARMACOLOGY

### Objectives

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

1. Describe the pharmacokinetics and pharmacodynamics of commonly used ocular Drugs.
2. Describe the Toxicology of ocular therapeutic agents
3. List the indications and contraindications of ocular drugs
4. Enumerate the drug delivery strategies in Ophthalmic drug use
5. State the diagnostic application of drugs in Ophthalmology

### Skill

1. Recognize adverse reactions
2. Communication skill
3. Observe experiments designed for the study of ocular drugs and interrupt them.
4. Scan information on common ocular pharmaceutical preparations.

## Syllabus

	<b>Hours</b>
<b>I. General Pharmacology</b>	
a) Mechanism of drug action	1
b) Pharmacokinetics of ocular drugs	2
c) Factors influencing penetration of ocular drugs	1
d) Adverse drug reactions	1
e) Toxicology of ocular therapeutic agents	1
f) Routes of ocular administration	1
g) Vitamins and Zinc deficiencies	1
<b>II Action of specific agents</b>	
1. CNS depressants	1
2. Anticoagulants, Surgical haemostasis and thrombolytic agents	2
3. Diuretics and hypertensive agents	2
4. Drugs used in cardiac failure, angina and shock	3
5. Histamines, antihistamines and mast cell stabilizers	2
6. Antidepressants	1
7. Prostaglandins and Serotonin	1
8. Ocular toxicity of some systemic drugs	1
<b>III Ophthalmological drug use</b>	
1. Antiglaucoma drugs	3
a) Drugs which increase the outflow of aqueous humour	

- b) Drugs which decrease the production of aqueous humour by the ciliary body
- c) Ocular hypotensives
2. Topical antibacterial agents for ophthalmic use 1
  3. Antifungal agents for ophthalmic use 1
  4. Antiviral agents for ophthalmic 1
  5. Therapeutic and diagnostic use of autonomic drugs 2
  6. Antiprotozoal agents and antiallergics 1
  7. Anti inflammatory agents like glucocorticoids and NSAIDS 1
  8. Mydriatics and miotics 1
  9. Topical Local anaesthetics 2
  10. Miscellaneous drugs like Tear substitutes and Wetting Agents Diagnostic agents – Fluorescein and Rose Bengal 1
- Antiseptics – Povidone iodine preservatives in ocular Preparations

**Total**

**35 Hrs.**

### **Theory Paper – I**

General Pharmacology & Ocular Pharmacology	-	Max: 40 marks
University Marks Maximum	-	40 Marks
One Internal Assessment	-	10 Marks

### **Text Books Recommended**

1. Pharmacology and Pharmacotherapeutics, R.S. Sathoskar and S.D. Bhandarkar 19<sup>th</sup> Edition
2. Essential of Medical Pharmacology, K.D. Tripathi, 5<sup>th</sup> Editon, Jaypee Brothers, New Delhi.

## **CORE COURSES**

### **1. OPTOMETRIC OPTICS**

- A. 1. Form of lenses and base curves
2. Lens tools – Lens blanks
3. Cylindrical lenses - Focal lines  
- Axis Rotation
4. Sphero Cylinder - Transposition  
Internal of Sturm's circle of least confusion  
Properties of Cylinder
5. Ophthalmic Prism - Definition  
Crossed Prism  
Risely Prism  
Effectivity  
Prentice's Rule

6. Spectacle Parameter - Near Visual point  
Induced and grounded prism  
Prentice's Rule  
Decentration of spherical lenses  
Prismatic effect of spherocylinder
  7. Determining lens power  
Lens clock  
Sagitta  
Neutralization with trial lenses  
Lensometry  
Cylinder power at opposite axis
- B.
1. Obliguly crossed cylinder
  2. Magnificatory lenses
  3. Tilt induced power
  4. Aberration in ophthalmic lenses
  5. Age plus lenses
  6. Absorptive lenses
  7. Definition – Lenses & Frames
  8. Types of Spectacle frames & Lenses
  9. Materials used for lenses & Frames
  10. Surface power and radius / refractive inter values
  11. Toric surface and their uses
  12. Best form spectacle lenses
  13. Vertex distance and vertex power
  14. Outlines of lens surfacing & polishing
  15. Ophthalmic prism units and uses
  16. Decentration of lenses and edge thickness
  17. Prismatic effects of spectacles
  18. The process of manufactory of glass, glastym and glass cements
  19. Toughered lens
- C.
1. Bifocal & multifocal lenses – types & characteristics
  2. Bifocal & multifocal lenses – purpose & choice
  3. Bifocal trifocal dispensing
  4. Focal & frame measurements
  5. Tinted lenses & abortive properties
  6. Tinted lenses - Examples and discussions
  7. Plastic lenses – Types and characteristics
  8. Safety and industrial eye protective lenses
  9. Special type of spectacles lenses
  10. Modern type of lenses – Vari focal lens  
Lenticular lens  
Aspheric lens  
High density lens  
Iseikonic lens
  11. Glass working - Spherical surfaces
  12. Glass working - Toric lenses
  13. Facults in lenses - description

14. Facults in lenses - detection
15. British standards for frames, lenses, eye protectors filters and Terminology
16. Usual lens forms
17. Spectacle magnifiers
18. Recumbent prisms & Fresnel prisms
19. Reflections from spectacle lenses, ghost images, refractions in bifocal at the dividing line.
20. Anti-reflection coating and multi – layer coating
21. Field of view of lenses.

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## 2. CLINICAL EXAMINATION OF VISUAL SYSTEMS & INSTRUMENTS

### OPTOMETRIC INSTRUMENTS

1. Simple Microscope
2. Compound microscope – Oil immersion eyepiece
3. Refractive instruments
  - Test Chart Standards
  - Choice of test charts
  - Canbridge crowding cards
  - Trial case lenses – Best forms
  - Refractor (Phoropter) head units
  - Optical considerations of refractor units
  - Trial frame design
  - Near vision difficulties with units and trial frame
  - Retinoscope – types available
  - Adjustment of retiscopes – Special features
  - Cylinder retinoscopy
  - Subjective Optometers
  - Incidence Optometers – Principles and details
  - Infra red Optometer devices
  - Interpretation of objective findings
  - Projection Charts
  - Illumination of the consulting room
  - Time & Motion study in refraction
  - Furniture and accessories in the practice
  - Instruments of the future.
4. Lensometer - Lens gauge or clock

## **OPHTHALMIC INSTRUMENTS**

1. Ophthalmoscopes
  - Direct
  - Indirect
  - Non – Contact Lenses – 70D – 90 D
2. Slit Lamp - Anterior segment – Details – Adjustments and Illumination
3. Tonometer - Types, Applanation
4. Fundus Camera - Principles, Techniques
5. External eye photography – Principles, Techniques
6. Keratometer
7. Refractionometer
8. Orthoptics Instruments
9. Colour Vision Testing Devices
10. Field of Vision
  - Perimeters
  - Automated Perimetry
  - Bjerrum’s Screen
  - Amsler Grid
11. Ultrasonography
  - A Scan
  - B Scan
12. Low Vision aids
  - Axial Biometry
13. Gonioscope - Non contact Fundus lenses
14. C.T. Scan
15. MRI Scan
16. RAF rule
17. Bagolini Straited glass
18. Prism Bar
19. Maddox rod
20. Maddox wing

## **CLINICAL EXAMINATION OF VISUAL SYSTEM**

1. History taking of an Ophthalmic care
2. Visual acuity testing – Distance, Near and colour Vision
3. Examination of muscle balance
4. Slit lamp examination
  - Examination of eye lids, conjunctiva and sclera
  - Neuro - Ophthalmological examination
  - Examination of Cornea
  - Examination of iris, ciliary body and pupil
  - Examination of lens
5. Examination of intraocular pressure and angle of anterior chamber
6. Ophthalmoscopy - Direct and Indirect
7. Examination of fundus
8. Examination of lacrimal system
9. Examination of the Orbit
10. Muscular function test
11. Visual field charting
12. Neuro – Ophthalmological examination

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### 3. VISUAL OPTICS

1. Review of geometric optics, Optics of ocular structures – Cornea
2. Measurement of the optical constants of the eye – Corneal curvature
3. Refractive anomalies
  - Growth of the eye in relation to refractive errors
  - Contributing variable, Population distribution
4. Refractive conditions
  - Emmetropia, Myopia, Hyperopia, Astigmatism, Accommodation, Presbyopia
  - Far and near points of accommodation
  - Correction of spherical ametropia
  - Axial versus refractive ametropia
5. Retinoscopy - Principles and methods, Design consideration
  - Speed of reflex and optimum condition

Review of objective and subjective refractive methods  
 Cross Cylinder  
 Difficulties in subjective tests and their avoidance  
 Transposition of lenses  
 Spherical equivalent  
 Effective power of lenses  
 Vertex distance effect  
 Ocular refraction versus spectacle refraction  
 Spectacle and relative spectacle magnification  
 Retinal image blur; depth of focus and depth of field  
 Retinoscopy model eye, Lensometry

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### 4. SYSTEMIC DISEASE MEDICINE

1. Systemic Hypertension – Aetiology, Pathogenesis, Pathology, Clinical manifestations, Investigations and treatment
2. Diabetes Mellitus – Aetiopathogenesis, Classification, Clinical features including complications, diagnosis and management
3. Acquired Heart disease – Embolism, Bacterial endocarditis
4. Cancer - Introduction
5. Connective Tissue Disease - SLE, Rheumatoid arthritis, Marfan's syndrome, Osteogenesis imperfecta
6. Thyroid Disease - Hypofunction & Hyperfunction
7. Tuberculosis
8. Helminthiasis - Guinea worm infection
9. Tropical Medical illness, Malaria, Toxoplasmosis, Leprosy
10. Malnutrition and Vitamin deficiency states
11. Immunology - Basic concepts

12. Neurological Disorders - Stroke, Meningitis, Ecephalitis, Demyalinating diseases, Hereditary Ataxias, Intracranial tumors, Head injury, Hydrocephalus, Subacute combine degeneration
13. Genetics - Basic Principles  
- Gene structure and function  
- Eye Disease  
- Generic Counseling  
- Generic Engineering
14. General Medical emergencies - First Aid

**Duration**

5 Hours per week - 5<sup>th</sup> Semester

5 Hours per week - 6<sup>th</sup> Semester

**Faculty**

Regular - 1 Assistant Professor of Medicine  
(MD with 3 yrs experience)

Guest - 1 Associate Professor / Professor of Medicine  
(MD with 5 yrs experience)

**Reference Book :**

1. Davidson's Principles and Practice of Medicine
2. K.V. Krishnad's - Textbook of Medicine

**Examination Pattern**

Theory & Practical at end of VI Semester as per the syllabus of M.G University

## 5. EYE DISEASES

### OCULAR DISEASES

1. EYE LIDS
2. LACRIMAL SYSTEM
3. SCLERA, EPISCLERA
4. ORBIT
5. CONJUNCTIVA
6. CORNEA
7. IRIS, CILIARY BODY AND PUPIL
8. CHOROIDS
9. VITREOUS
10. RETINA
11. NEURO OPHTHALMOLOGY
12. LENS
13. TRAUMA
14. BLINDNESS

- 15. GALUCOMA
- 16. CLINICS - Case Sheet
  - History taking
  - Test for phorias and tropias
  - External Examination
  - Slit Lamp Examination
  - Drugs & Methods of application
  - Dos – Don't's – Pupillary dilatation
  - Direct Ophthalmology
  - Indirect Ophthalmology

## **6. DISPENSING OPTICS & MECHANICAL OPTICS CONTACT LENS & LOW VISION AIDS**

### **DISPENSING OPTICS – MECHANICAL OPTICS**

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

### **CONTACT LENS**

- 1. History
- 2. Relevant anatomy & Physiology
- 3. Indications
- 4. Contraindications
- 5. Materials
- 6. Keratometer
- 7. Filling Philosophies
- 8. Handling Instructions
- 9. Follow – up, Post filling problems
- 10. Fitting in astigmatism
  - Fitting in Keratoconus
  - Fitting in Aphakia
- 11. Inspection and verification
- 12. Contact Lens Solutions
- 13. Special Lenses indications



14. Soft Lenses
15. Optics
16. Slit Lamp examination for contact lens patients
17. Cosmetic Contact Lenses
18. Artificial Eyes

### **VIII LOW VISION AID**

1. Identifying the low vision patient
  2. History
  3. Refraction
  4. Evaluating near vision, Amsler Grid and field defects
  5. Demonstrating aids
  6. Teaching the patient to use aids
  7. Guide to selecting low vision aids
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## **7. BINOCULAR VISION & SQUINT**

1. Spatial sense
  2. Evolution of Binocular vision
  3. Binocular fusion, Suppression, Rivalry and summation
  4. Visual direction, Local sign and corresponding points
  5. Visual distance, Empirical cues
  6. Panum's Space
  7. Stereopsis
  8. Development of Binocular Vision
  9. The Longitudinal horopter
  10. Neural aspects of Binocular Vision
  11. Visually guided behavior and aniseikonia
  12. A.R.C
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1. Amblyopia and eccentric fixation
  2. Treatment and amblyopia
  3. Qualitative and quantitative diagnosis of strabismus
  4. Esodeviations
  5. Exodeviations
  6. A.V phenomena
  7. Cyclovertical Squit
  8. Psuedostrabismus
  9. Special forms of strabismus
  10. Nystagmus
  11. Non surgical management of strabismus
  12. Review of Orthoptic procedures
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## 8. COMMUNITY OPTOMETRY

PAEDIATRIC, GERIATRIC OPTOMETRY  
 PUBLIC HEALTH OPTOMETRY  
 COMMUNITY OPTOMETRY  
 OCCUPATIONAL HEALTH  
 LAW AND OPTOMETRY  
 THEATRE TECHNIQUES & STERILIZATION TECHNIQUES

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## 9. PROJECT

### Posts Required

#### OPTOMETRIST

- 2 Senior Full time Optometrist (M.Sc. Optometry or B.Sc. Optometry with 5 year teaching experience).
- 2 Junior Optometrist (B.Sc. Optometry)
- 2 Ophthalmic Assistants (Diploma in Ophthalmic Assistance)

#### OPHTHALMOLOGIST

- 1 Professor to Head of the Department (MS Ophthalmology)
- 1 Associate Professor (MS Ophthalmology)
- 1 Assistant Professor (MS Ophthalmology)
- 2 Senior Lecturers (MS Ophthalmology)

The Institution may be started as a separate “School of Optometry”. For clinical training the students can be send to the respective departments (Ophthalmology and Medicine) of various hospitals. Additional teaching facilities may be provided which included man power, space and instruments.

## MINIMUM STANDARD REQUIRED FOR B.Sc. OPTOMETRY COURSE

### Infrastructure

Sl. No.	Description	Nos.	Specification
1	Area – Municipality & Corporation Limit – Other		25 Cents  50 Cents

2	Building		9,000 sq. ft.
3	Lecture Halls	4	30 ft x 20 ft.
4	Laboratories	3	30 ft. x 30 ft.
5	Auditorium	1	50 ft. x 30 ft.
6	Library	1	30 ft. x 20 ft with 1000 books of related subjects including journals
7	Other		Teaching aids OHP etc., Separate common room for boys and girls. Staff rooms, toilet facilities for staff and students. Hostel facilities for Boys and Girls wherever necessary

### **Hospital / Vision Care Facility**

<b>Sl. No.</b>	<b>Description</b>	<b>Nos.</b>	<b>Specification</b>
1	Out Patients	100	100 Patients daily
2	Labs	3	1. Physics Lab 2. Work Shop 3. Visual Lab for Refraction

### **Staff**

<b>Sl. No.</b>	<b>Description</b>	<b>Nos.</b>	<b>Specification</b>
1	Director	1	MBBS + MS (Oph) + 3 years experience
2	Lecturer	2	MBBS
3	Tutor Technician	2	B.Sc. in Refraction or B.Sc. in Optometry
4	Optometrician	1	B.Sc. Optometry
5	Lab Assistant	2	SSLC + 1 year experience
6	Administrative Officer	1	Graduate with experience in administration for 3 years, Degree or Diploma in Hospital Management preferred
7	Assistant	2	Graduate with Computer Knowledge

**List of Instruments Required in Mechanical Workshop**

Sl.No	Description of Items	Qty.
1	Spherical Machine	1
2	Cylindrical Machine	1
3	Cylindrical Button	5 nos.
4	Cylindrical Sticks	2 nos.
5	Guage of Brass	1 set
6	Spherical Blocks - Ordinary	8 doz
7	Pressure Pins	1 set
8	Centre Nipples	4 doz
9	Cyl : Governor	2
10	Lensometer	1
11	Heater, Hanner, Pile, Grinding, Stone etc..	1 set
12	Grinding Powder MA 2	2 Kg.
13	Grinding Powder MA 3	2 Kg.
14	Rough Blank Buttons	100
15	Serium Oxide Grade A	10 Kg.
16	Tar Pitch	25 Kg.
17	Cylindrical lap toric base	1 set
18	Cylindrical Governor	1
19	Centre Nipples	1 doz
20	Spherical Lamp	1 set
21	Velvette Polishing Cloth	5 m.

**List of Instruments Required in Physical Laboratory**

Sl.No	Description of Items	Qty.
1	Nodel Slide Assembly 'Leader' complete with Optical Bench	2
2	Spectrometer 6" scale VR 1 minute in box	4
3	Lens Convex Sonm Dia – FL 10 cm	4
4	- do – 20 cm	4
5	- do – 30 cm	4
6	- do – 15 cm	4
7	Glass Slab 100 x 50 x 18 mm	4
8	Air Wedge	4
9	Plane Diffraction Gratings - 15,00 lines per inch area – 50 x 32	3 nos. 4
10	Small Angle Prisms Angle 300, Size 30 x 30 mm face Optical Polished	4
11	Refracting Gratings	2
12	Concave Mirror - 5 cm	4

	Dia - 20 cm, F.L	
13	- do - 15 F.L	4
14	- do - 10 F.L	4
15	Convex Mirror - 15 cm F.L	4
16	- do - 25 F.L	4
17	Watch Glass, 7.5 cm dia	8
18	Glass Prism for pin Tracing Experiment	4
19	Spectrometer Prism, DF	4
20	Illuminated wire guaze	4
21	Lens stand Single	4
22	White Screen - Wooden	4
23	Retort stand 20 cm x 15 cm base with 100 cm x 8 mm dia	12
24	Iron clamps with boss head (Large size)	12
25	Air film Rectangular frame for critical angle experiment	4
26	Biprism low angle 40 x 30 mm	4
27	Newtons Ring Apparatus	4
28	Plano convex lens 5 cm dia, WO F.L	4
29	Plano concave lens 5 cm	4
30	Pointer head for liquid line experiment	4
31	Optic lever single with 1 ¼ " x 1 ¼ " mirror	2
32	-do - double	2
33	Students Polarimeter 'focus' model - SPJ. 8(B) fitted with hi quartz	2
34	Sodium Vapour Lamp - Imported make with Indian leak Transformer 30 x -35 watts (Bulb + Transformer)	4
35	Mercury Vapour Lamp with choke to work on 220 Volts AC main	4
36	Drawing Boards Superior	8
37	Sherometer	4
38	Meter Scale One meter 1 <sup>st</sup> marked	30
39	Half meter Scale	30