

SYLLABUS

**for Courses affiliated to the
Kerala University of Health Sciences**

Thrissur 680596



BACHELOR OF SCIENCE IN OPTOMETRY

Course Code: 013

(2016-17 Academic year onwards)

2016

2. Course Content

2.1 Title of course:

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

2.2 Objectives of 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

2.3 Medium of instruction:

Medium of instruction shall be English

2.4 Course outline

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

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.

BASIC SCIENCE COURSE

1. English
2. Physics
3. Basics in applied Chemistry
4. Mathematics
5. General Anatomy
6. Ocular Anatomy
7. General Physiology
8. Ocular Physiology
9. Information Technology
10. Nutrition & Biochemistry
11. Microbiology
12. Pathology
13. Pharmacology

CORE COURSES

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

2.5 Duration

The duration of the course shall be 3 (three) year + one year compulsory rotating internship which follows semester system with examinations at the end of each year. Approximately 240 working days in a year with a minimum of 6 hours per day which works approximately 1450 working hours per year. After the 3rd year, they have to do a compulsory rotating internship in various specialty departments for one year.

2.6 Subjects

As given under “Teaching learning methods “and “Content of each subject in each year”

2.7 Total number of hours

Approximately 240 working days in a year with a minimum of 6 hours per day which works approximately 1450 working hours per year.

2.8 Branches if any with definition :

Not applicable

2.9 Teaching learning methods:

BASIC SCIENCE COURSES

First Year

1. ENGLISH

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 – apologies 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. PHYSICAL AND GEOMETRICAL OPTICS

GEOMETRICAL OPTICS I

No.	Topics	No of hrs.
1	Nature of light – light as electromagnetic oscillation; ideas of sinusoidal oscillations; amplitude and phase; speed of light in vacuum and other media; refractive index.	2
2	Wavefronts – spherical, elliptical and plane; Curvature and vergence; rays; convergence and divergence in terms of rays and vergence; vergence at a distance	2
3	Refractive index; its dependence on wavelength	1
4	Fermat's and Huygen's Principle – Derivation of laws of reflection and refraction (Snell's law) from these principles	4
5	Plane mirrors – height of the mirror; rotation of the mirror	1

6	Reflection by a spherical mirror – paraxial approximation; sign convention; derivation of vergence equation	1
7	Imaging by concave mirror	2
8	Imaging by convex mirror	2
9	Reflectivity; transmittivity	1
10	Snell's Law; refraction at a plane surface	1
11	Glass slab; displacement without deviation; displacement without dispersion	2
12	Thick prisms; angle of prism; deviation produced by a prism; refractive index of the prism	2
13	Prisms; angular dispersion; dispersive power; Abbe's number.	2
14	Definition of crown and flint glasses; materials of high refractive index	1
15	Thin prism – definition; definition of Prism diopter; deviation produced by a thin prism; its dependence on refractive index	2
16	Refraction by a spherical surface; <i>sign convention</i> ; introduction to spherical aberration using image formed by a spherical surface of a distance object; <i>sag formula</i>	3
17	Paraxial approximation; derivation of vergence equation	1
18	Imaging by a positive powered surface	2
20	Imaging by a negative powered surface	2
21	Vergence at a distance formula; effectivity of a refracting surface	1
22	Definition of a lens as a combination of two surfaces; different types of lens shapes.	1
23	Image formation by a lens by application of vergence at a distance formula; definitions of front and back vertex powers; equivalent power; first and second principal planes/points; primary and secondary focal planes/points; primary and secondary focal lengths	4
24	Newton's formula; linear magnification; angular magnification	2
25	Nodal Planes	1
26	Thin lens as a special case of thick lens; review of sign convention	1
27	Imaging by a thin convex lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions	2

28	Imaging by a thin concave lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions	2
29	Prentice's Rule	1
30	System of two thin lenses; review of front and back vertex powers and equivalent power, review of six cardinal points.	2
31	System of more than two thin lenses; calculation of equivalent power using magnification formula	2
	Total number of Lectures	49

Text book:

- Tunnacliffe A. H, Hirst J. G, *Optics*, The association of British Dispensing Opticians, London, U.K., 1990.
- Pedrotti L. S, Pedrotti Sr. F. L, *Optics and Vision*, Prentice Hall, New Jersey, USA, 1998.

Reference Books:

- Loshin D. S. *The Geometric Optics Workbook*, Butterworth-Heinemann, Boston, USA, 1991.
- Schwartz S. H. *Geometrical and Visual Optics: A Clinical Introduction*, McGraw-Hill, New York, USA, 2002.
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GEOMETRICAL OPTICS II

1	Cylindrical Lenses; image formation; relation between cylinder axis and line image orientation	2
2	Imaging due to two cylinders in contact with axes parallel	1
3	Two cylinders in contact with axes perpendicular; line images and their orientations to the cylinders' powers; interval of Sturm; circle of least confusion (CLC); spherical equivalent; position of CLC	6
4	Spherical lens and a cylindrical lens in contact; spherical equivalent; interval of Sturm and CLC	2
5	Spherocylindrical lens notations – plus/minus cylinder form, cross cylinder/meridian form; transformations between them	3
6	Field stops and apertures; entrance and exit pupils	1
7	Apertures and defocus blur	1
8	Receiver/detector diameter; depth of focus; depth of field	1
9	Chromatic Aberrations; methods of removing chromatic aberrations; Abbe number	2

10	Monochromatic Aberrations – deviation from paraxial approximation; difference between ray aberrations and wavefront aberrations	2
11	Third order aberrations – spherical aberrations; coma; astigmatism; distortion and curvature of fields	2
12	Ways of minimizing spherical aberrations – pupil size, bending of lens, shape factor	2
13	Lens tilt – astigmatism	1
14	Higher order aberrations; introduction to Zernike Polynomials	1
15	Telescopes – Keplerian, Galilean and Newtonian; position of cardinal points, entrance and exit pupils; magnifications; advantages and disadvantages	4
16	Microscopes – magnification; tube length.	2
17	Gullstrand's Schematic Eye (GSE); calculation of the power of the cornea, the lens and the eye; axial length; calculation of the position of the cardinal points; magnification	2
18	GSE - Purkinje images and their reflectances	1
19	GSE - entrance and exit pupils for a 3mm pupil; ocular aberrations – spherical aberrations and coma; chromatic aberrations.	2
20	GSE – introduction to refractive errors - myopia and hyperopia; corneal curvature; axial length; far point; blur size calculations; corrections; astigmatism; blur size; circle of least confusion; correction.	4
21	GSE - Object closer than at infinity; introduction to accommodation; far point; near point; presbyopia; spectacle and contact Lens corrections - comparison of magnification	3
	Total number of Lectures	45

Text book:

- Tunnacliffe A. H, Hirst J. G, *Optics*, The association of British Dispensing Opticians, London, U.K., 1990.
- Pedrotti L. S, Pedrotti Sr. F. L, *Optics and Vision*, Prentice Hall, New Jersey, USA, 1998.

Reference Books:

- Loshin D. S. *The Geometric Optics Workbook*, Butterworth-Heinemann, Boston, USA, 1991.
- Schwartz S. H. *Geometrical and Visual Optics: A Clinical Introduction*, McGraw-Hill, New York, USA, 2002.

PHYSICAL OPTICS

No.	Topics	No of hrs.
1	Nature of light – light as electromagnetic oscillation – wave equation; ideas of sinusoidal oscillations – simple harmonic oscillation; transverse nature of oscillation; concepts of frequency, wavelength, amplitude and phase.	7
2	Sources of light; Electromagnetic Spectrum.	1
3	Polarized light; linearly polarized light; and circularly polarized light.	1
4	Intensity of polarized light; Malus' Law; polarizers and analyzers; Methods of producing polarized light; Brewster's angle.	2
5	Birefringence; ordinary and extraordinary rays.	2
6	Relationship between amplitude and intensity.	1
7	Coherence; interference; constructive interference, destructive interference; fringes; fringe width.	2
8	Double slits, multiple slits, gratings.	2
9	Diffraction; diffraction by a circular aperture; Airy's disc	2
10	Resolution of an instrument (telescope, for example); Raleigh's criterion	2
11	Scattering; Raleigh's scattering; Tyndall effect.	2
12	Fluorescence and Phosphorescence	1
13	Basics of Lasers – coherence; population inversion; spontaneous emission; Einstein's theory of lasers.	5
14	Radiometry; solid angle; radiometric units; photopic and scotopic luminous efficiency and efficacy curves; photometric units	4
15	Inverse square law of photometry; Lambert's law.	2
16	Other units of light measurement; retinal illumination; Trolands	1
	Total number of Lectures	37

Text Book: Subrahmanyam N, Brij Lal, *A text book of Optics*, S. Chand Co Ltd, New Delhi, India, 2003.

Reference Books:

Pedrotti L. S, Pedrotti Sr. F. L, *Optics and Vision*, Prentice Hall, New Jersey, USA, 1998.
Keating NM. P,

Practical: (20 hours)

Each practical session could be evaluated for 10 marks and the total could be added to the final evaluations. These practical's could be customized as per the university requirements and spaced apart conveniently. The practical's to be done include the following:

- Thick Prism – determination of prism angle and dispersive power; calculation of the refractive index
- Thin Prism – measurement of deviation; calculation of the prism diopter
- Image formation by spherical mirrors
- Convex lens - power determination using lens gauge, power determination using distant object method; power determination using the vergence formula
- Concave lens – in combination with a convex lens – power determination.
- Construction of a tabletop telescope – all three types of telescopes.
- Construction of a tabletop microscope
- Imaging by a cylindrical lens – relationship between cylinder axis and image orientation
- Imaging by two cylinders in contact – determination of the position of CLC; verification of CLC using a spherical lens with power equal to the spherical equivalent; orientations and position of the line images and their relation to the cylinders' powers and orientations
- Imaging by a spherocylindrical lens – sphere and cylinder in contact – determination of the position of CLC; verification of CLC using a spherical lens with power equal to the spherical equivalent; orientations and position of the line images and their relation to the cylinder's power and orientation

3. BASICS IN APPLIED CHEMISTRY

Total Hours – 40

General and Organic Chemistry (Theory)

1. Bonding in hydrocarbons and introduction to reaction mechanism:
Hybridisation involving s and p orbitals, geometry of methane, ethane, ethane, 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 chloromycetin.

Vitamins and Hormones : Structure and biological activities of Vitamin A, B1, B12, 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

Total hours - 40

- 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 – nth 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

- Statistics graphs & Diagrams
- Measurement of central tendency, dispersion & correlation
- Tests of hypothesis (z-test, t-test, Chi-square)

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
- 7.

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. |

TOTAL HOURS : 30 Hours

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.
- TOTAL HOURS : 25 + 10 - 35 hrs.**

Books Prescribed for study

Text Book:

- a) BD Chaurasia: Handbook of general Anatomy, Third edition, CBS Publishers, New Delhi, 1996
- b) GJ Tortora, B D logy, 11th edition, John Wiley & Sc

6. OCULAR ANATOMY

No.	Topics	No of hrs
1	Cornea: Anatomy of all the layers, cellular structure, nerve supply, reason for transparency, refractive properties	2
2	Coats of eyeball: 1. Sclera (episclera & sclera) 2. Choroid (Iris, ciliary body, choroid) 3. Retina Detailed anatomy, cellular structure, vasculature, nerve supply for all the above coats, pupils, nerve supply for pupillary actions, pupillary pathway.	6
3	Crystalline lens	2
4	Aqueous, anterior chamber, vitreous body	3
5	Ocular Embryology	2
6	Detailed study of orbit	2
7	Ocular Adnexa and Lacrimal system	2
8	Extra ocular muscles (anatomy, innervations, action)	2
9	Orbital Blood supply	2

10	CRANIAL NERVES: Detailed study of each of the following nerves in terms of their nuclei, course, relationship within brain, effects of compression etc at different regions 1. Optic nerve 2. Oculomotor nerve 3. Trochlear nerve 4. Trigeminal nerve 5. Abducent nerve 6. Facial nerve	10
11	Visual Pathway	3
12	Autonomic Innervations of Ocular structures	3
	Total Number of Hours	39

Reference Books:

- AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006
- L A Remington: Clinical Anatomy of the Visual System, Second edition, Elsevier Butterworth Heinemann, Missouri, USA, 2005.

7. PHYSIOLOGY

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

Details

I. HAEMATOLOGY 12 hrs.

Introduction, Composition & function of blood,
 specific gravity, Viscosity Plasma proteins 1 hr.

Red Blood Cells

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.

White Blood Cells

Morphology, Normal total count, differential count, Variations, Properties and Functions, Leucopoiesis, Factors affecting. 2 hrs.

Platelets

Morphology, Normal count, Variations, Functions of Platelets, Hemostasis – Details, Thrombopoiesis 1 hr.

Coagulation of Blood

Clotting factors, Intrinsic & Extrinsic mechanisms, Defects in Coagulation, Bleeding time, Clotting time, Anticlotting mechanisms in the body, Anticoagulants 2 hrs.

Blood Groups

ABO system, Landsteiner's laws, Importance of cross matching, Blood transfusion, complications of mismatched blood transfusion, Rh system, Rh incompatibility 1 hr.

Blood Volume

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.

II. CARDIO VASCULAR PHYSIOLOGY 10 hrs.

Functional anatomy, conducting system of heart origin & conduction of Impulses 1 hr.

Cardiac cycle, Various phases, heart sounds ECG 2 hrs.

Cardiac Output

Definition normal values variations, Regulation of stroke volume – Homometric – heterometric, One method to meas Cardiac output 2 hrs.

Heart Rate

Normal value, Variations, regulation of heart rate 1 hr.

Arterial Pulse

Blood Pressure

Definition, Normal, Value variations, Determinations of Blood pressure, Estimation of Blood pressure, Regulation of Blood pressure, Shock, Compensatory mechanisms in shock 3 hrs.

Regional Circulation

Coronary Circulation, Pulmonary Circulation, Cutaneous circulation, Cerebral circulation 1 hr.

III. RESPIRATORY SYSTEM 8 hrs

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.

O₂ 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.

IV. **GASTROINTESTINAL SYSTEM** 8 hrs.

Functional anatomy, Enteric nervous system, Salivary secretion,
Innervation of Salivary glands, Composition & functions
of Saliva, Regulation of secretion 2 hrs.

Gastric secretion

Gastic glands, Composition & functions of pancreatic juice.
Regulation, Hydrochloric acid secretion, factors affecting,
Peptic ulcer 1 hr.

Pancreatic secretion

Functional anatomy, composition & functions of pancreatic juice.
Regulation of pancreatic secretion 1 hr.

Liver

Functional anatomy, composition & functions of Bile
regulation of secretion. Bile salts, Bile pigments,
Enterophepatic circulation, Jaundice, Functions of gall Bladder 1 hr.

Movements of GIT

Mastication, Deglutition – stages, Gastric movements,
Small intestinal movements, small intestinal movements,
Abnormalities 2 hrs.

Movements of large intestine Defecation reflex, Abnormalities 1 hr.

	Digestion & absorption of Carbohydrates, Proteins & fat	1 hr.
V.	RENAL PHYSIOLOGY	5 hrs.
	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.
	Urinary Bladder	
	Innervation, Micturition reflex, Cystometrogram, Abnormalities	1 hr.
VI.	PHYSIOLOGY OF CENTRAL NERVOUS SYSTEM	15 hrs.
	Sensory System	
	Organisation of nervous system, Functional 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.
	Thalamus	
	Functional anatomy, connections & functions,	
	Thalamic Syndrome	1 hr.
	Motor System	
	Functional anatomy, Pyramidal tract, Lesions, Differences	
	between upper Motor & Lower motor neuron lesions	2 hrs.
	Basal Ganglia	
	Functional anatomy, connections & functions, Parkinsonism	1 hr.

Cerebellum

Gross structure, Histology, connections & functions,

Cerebellar lesion 1 hr.

Limbic System

Connections & Functions 1 hr.

Reticular formation – connections functions, Ascending

Reticular Activating System 1 hr.

Vertibular apparatus

Functional anatomy receptors, Connections & Functions 1 hr.

Cerebral Cortex

Brodmanns areas, functions,

Higher functions – Speech
Learning

Sleep & EEG Memory

Hypothalamus - Connections & 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, Endocochleor 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, Radiommunoassay 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.

Posterior Pituitary - Hormones, Actions

Neuroendocrine Reflexes 1 hr.

Thyroid Gland - Hormones secreted

synthesis, actions, Regulation of secretion clinical abnormalities 2 hrs.

Hormones regulating blood calcium level, Para Hormone,

Calatoinin, 1-25 di OH Chole calciferol 1 hr.

Adrenal Cortex

Hormones, Biosynthesis, Actions, Regulations,
Clinical abnormalities 1 hr.

Adrenal Medulla

Hormones, Biosynthesis, Actions, Clinical abnormalities 1 hr.

Endocrine Pancreas

Histology, Hormones – Insulin, Glucagon, Actions,
regulation of secretion, Clinical abnormalities 1 hr.

Pineal Gland – Local hormones 1 hr.

IX. TEMPERATURE REGULATION, CSF, ANS etc. 2 hrs.

Practicals : **Total** 10 hrs.

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

Reference Book:

- AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006
- A C Guyton: Text book of Medical Physiology, 6th edition, saunders company, Japan, 1981
- G J Tortora, B Derrickson: Principles of anatomy & physiology, 11th edition,
- John Wiley & Sons Inc, New Jersey, 2007

8.Ocular Physiology

No.	Topics	No of hrs
1.	Protective mechanisms in the eye	1
2.	Precorneal tear film, eyelids and lacrimation	2
3.	Extrinsic Ocular muscles, their actions and control of their movements	2
4.	Saccadic, smooth pursuit and Nystagmic eye movements	2
5.	Corneal Physiology	4
6.	Aqueous humor and vitreous: Intra ocular pressure	3
7.	Iris and pupil	3
8.	Crystalline lens and accommodation – presbyopia	2
9.	Retina – structure and functions, dark and Light Adaptations	4
10.	Vision – general aspects of sensation	2
11.	Pigments of the eye and photochemistry, electrophysiology	4
12.	The visual stimulus, refractive errors	3
13.	Visual acuity, vernier acuity and principle of measurement	2
14.	Visual perception – Binocular vision, stereoscopic vision, optical illusions	4
15.	Visual pathway, central and cerebral connections, lesions of pathway and effects	4
16.	Colour vision and colour defects. Theories and diagnostic tests	3
	Total number of Hours	45

Reference Book:

- RD Ravindran: Physiology of the eye, Arvind eye hospitals, Pondicherry, 2001
- PL Kaufman, A Alm: Adler's Physiology of the eye clinical application, 10th edition, Mosby, 2002
- AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006

SECOND YEAR**6. INFORMATION TECHNOLOGY****Total hours-20****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 EUI 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.

11. 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; Galactose & 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.

- Introduction to Nutrition, food group and food pyramids.
- Assessment of Nutritional status.
- Role of nutrition in ocular aging.

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 10th editing)

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, amebae 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 – 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.

Prescribed Books:

1. Greenwood. D, Slack RCB, Peuthere JF, Medical Microbiology 15th 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, 4th 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 eteological factors that contribute to the natural history of common diseases.

2. DETAILED SYLLABUS		
Total number of Lectures	-	40 hrs.
Number of hours for practical Demonstration-2x5	-	10 hrs
Total		50 hrs

SYLLABUS OF THEORY CLASSES

Topic

Hours

Introduction and Eteology

1

Degeneration, Adoptosis, 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, Clamydial Infection	
Neoplasia	5
Definitions	
Classifications	
Behaviour of benign and Malignant Neoplasm	
Spread of Tumours	
Eteopathogenesis	
Diagnostic methods	
Haematology	
Introduction and RBC disorders	2
WBC disorders, Plasma cell dyserasia	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

Reference books:

- CORTON KUMAR AND ROBINS: Pathological Basis of the Disease, 7th Edition, Elsevier, newDelhi, 2004.
- S R Lakhani Susan AD & Caroline JF: Basic Pathology: An introduction to the mechanism of disease, 1993.
- K S Ratnagar: Pathology of the eye & orbit, Jaypee brothers Medical Publishers, 1997

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

I.	General Pharmacology	Hours
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
II	Action of specific agents	

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
III Ophthalmological drug use	
1. Antiglaucoma drugs 3	
a) Drugs which increase the outflow of aqueous humour	34
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 Antiseptics – Povidone iodine preservatives in ocular Preparations	1
11. BLS & emergency care	2

Total

37 Hrs.

Text Books Recommended

- Pharmacology and Pharmacotherapeutics, R.S. Sathoskar and S.D. Bhandarkar 19th Edition
- Essential of Medical Pharmacology, K.D. Tripathi, 5th Editon, Jaypee Brothers, New Delhi.
- K D TRIPATHI: Essentials of Medical Pharmacology. 5th edition, Jaypee, New Delhi, 2004

CORE COURSES

1. OPTOMETRIC OPTICS

No.	Topic	No. of Lectures
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 prims	4
3	Lenses – Definition, units, terminology used to describe, form of lenses	2
4	Vertex distance and vertex power, Effectivity calculations	2
5	Lens shape, size and types i.e. spherical, cylindrical and Sphero-cylindrical	1
6	Transpositions – Simple, Toric and Spherical equivalent	1
7	Prismatic effect, centration, decent ration and Prentice rule, Prismatic effect of Plano-cylinder and Sphero-cylinder lenses	4
8	Spherometer & Sag formula, Edge thickness calculations	3
9	Magnification in high plus lenses, Minification in high minus lenses	1
10	Tilt induced power in spectacles	1
11	Aberration in Ophthalmic Lenses	1

	Total Hours	21
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No.	Topic	No. of Lectures
1	Raw materials – History and General Outline, Manufacturing of Ophthalmic Blanks – Glass & Plastics, Terminology used in Lens Workshops, Surfacing process from Blanks to lenses	1 4
2	Definition & Materials (Glass, Plastics, Polycarbonate, Triology) types and Characteristics	4
3	Properties (Refractive index, specific gravity, UV cut off, impact resistance – include drop ball test, abbe value, Center thickness)	4
4	Best form of lenses & Safety standards for Ophthalmic lenses (FDA, ANSI, ISI, Others)	2
5	Design of High Powered Lenses Hi-index lenses, Calculation of Refractive index	2
6	Bifocal designs, their manufacturing & uses (Kryptok, Unis D, Executive, Invisible, Occupational)	6
7	Progressive Addition Lenses, modified near vision lenses (designs, advantages, limitations)	3
8	Lens enhancements (Scratch resistant coatings – spin/dip, Anti-reflection coating, UV coating, Hydrophobic coating, anti-static coating)	4
9	Lens defects – Description and Detection	2
10	Glazing & edging (manual & automatic)	2
11	Special lenses ➤ Lenticulars ➤ Aspherics ➤ Fresnel lenses & Prisms ➤ Aniseikonic lenses ➤ Photochromics ➤ Polaroids ➤ Tinted lenses – Tints, filters	6
12	History of Spectacles, manufacturing overview, Definition, parts & measurements	2

13	Classification of frames – Materials (cover in detail), Colours and Temple position (advantages & disadvantages, where to use)	4
14	Special purpose frames (sports, kids, reading)	1
	Total hours	42

Reference Books:

- David Wilson: Practical Optical Dispensing, OTEN- DE, NSW TAFE Commission, 1999
- C V Brooks, IM Borish: System for Ophthalmic Dispensing, Second edition, Butterworth-Heinemann, USA, 1996
- Jalie M: The principles of Ophthalmic Lenses, The Association of Dispensing Opticians, London, 1972

2. CLINICAL EXAMINATION OF VISUAL SYSTEMS & INSTRUMENTS

Topic	No. of hours
1. REFRACTIVE INSTRUMENTS ➤ Optotypes and MTF, Spatial Frequency ➤ Test charts standards. ➤ Choice of test charts ➤ Trial case lenses ➤ Refractor (phoropter) head units ➤ Optical considerations of refractor units ➤ Trial frame design ➤ Near vision difficulties with units and trial frames ➤ Retinoscope – types available ➤ Adjustment of Retinoscopes- special features ➤ Objective optometers. ➤ Infrared optometer devices. ➤ Projection charts ➤ Illumination of the consulting room. ➤ Brightness acuity test ➤ Vision analyzer ➤ Pupilometer , ➤ Potential Acuity Meter, ➤ Abberometer	12
2. OPHTHALMOSCOPES AND RELATED DEVICES ➤ Design of ophthalmoscopes - illumination ➤ Design of ophthalmoscopes- viewing ➤ Ophthalmoscope disc ➤ Filters for ophthalmoscopy ➤ Indirect ophthalmoscope	3 hours
3. Lensometer, Lens gauges or clock	2 hours
4. Slit Lamp	2 hours
5. Tonometers	2 hours
6. Keratometer and corneal topography	2 hours
7. Refractometer	1 hour
8. Orthoptic Instruments (Synaptophore Only)	1 hour

9. Color Vision Testing Devices	1 hour
10. Fields Of Vision And Screening Devices	2 hours
11. Scans	1 hour
12. ERG	1 hour
13. New Instruments	2 hours
14. Automation in Optometry	2 hours
Total no. hrs	34 hours

Reference books:

- **P R Yoder**: Mounting Optics in Optical Instruments, SPIE Society of Photo-Optical Instrumentation, 2002
- **G Smith, D A. Atchison**: The Eye and Visual Optical Instruments, Cambridge University Press, 1997
- David Henson: Optometric Instrumentations, Butterworth- Heinemann, UK, 1991

CLINICAL EXAMINATION OF VISUAL SYSTEMS

Sl. No.	Topic	No. of hours
1.	History taking,	4
2.	Visual acuity estimation	1
3.	Extraocular motility, Cover test, Alternating cover test	2
4.	Hirschberg test, Modified Krimsky,	1
5.	Pupils Examination	1
6.	Maddox Rod,	1
7.	van Herrick,	1
8.	External examination of the eye, Lid Eversion	1

9.	Schirmer's, TBUT, tear meniscus level, NITBUT (keratometer),	2
10.	Color Vision	1
11.	Stereopsis,	1
12.	Confrontation test,	1
13.	Photostress test,	1
14.	Slitlamp biomicroscopy,	3
15.	Direct Ophthalmoscopy,	1
16.	Digital pressure, Schiotz Tonometry, Applanation Tonometry Gonioscopy	3
17.	ROPLAS	1
18.	Amsler test,	1
19.	Corneal Sensitivity, HVID	1
20.	Saccades and Pursuits	1
	Total no. hours	29

Reference Books:

- T Grosvenor: Primary Care Optometry, 5th edition, Butterworth – Heineman, USA, 2007.
- A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007
- [D B. Elliott](#) :Clinical Procedures in Primary Eye Care,3rd edition, Butterworth-Heinemann, 2007
- [Jack J. Kanski](#) Clinical Ophthalmology: A Systematic Approach,6th edition, Butterworth-Heinemann, 2007
- J.B Eskridge, J F. Amos, J D. Bartlett: Clinical Procedures in Optometry, Lippincott Williams and Wilkins,1991
- [N B. Carlson](#) , [DI Kurtz](#): Clinical Procedures for Ocular Examination ,3rd edition, McGraw-Hill Medical, 2003
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3. VISUAL OPTICS

Topic	No. of hours
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1. REVIEW OF GEOMETRICAL OPTICS VERGENCE AND POWER: 1.1 Conjugacy, object space and image space 1.2 Sign convention 1.3 Spherical refracting surface 1.4 Spherical mirror; catoptric power 1.5 Cardinal points 1.6 Magnification 1.7 Light and visual function Clinical Relevance of: Fluorescence, Interference, Diffraction, Polarization, Bi-refringence, Dichroism 1.9 Aberration and application Spherical and Chromatic	4 hours
2.OPTICS OF OCULAR STRUCTURE 2.1 Cornea and aqueous 2.2 Crystalline lens 2.3 Vitreous 2.3 Schematic and reduced eye	2 hours
3.MEASUREMENTS OF OPTICAL CONSTANTS OF THE EYE 3.1 Corneal curvature and thickness 3.2 Keratometry 3.3 Curvature of the lens and ophthalmophakometry 3.4 Axial and axis of the eye 3.5 Basic Aspects of Vision. • Visual Acuity • Light and Dark Adaptation • Color Vision • Spatial and Temporal Resolution • Science of Measuring visual performance and Clinical Optometry Application to	8 hours
4. REFRACTIVE ANOMALIES AND THEIR CAUSES 4.1 Etiology of refractive anomalies 4.2 Contributing variability and their ranges 4.3 Populating distributions of anomalies. 4.4 Optical component measurements 4.5 Growth of the eye in relation to refractive errors	6 hours
Total hours	20 hours

Topic	No. of hours
1.Refractive conditions ➤ Emmetropia ➤ Myopia ➤ Hyperopia ➤ Astigmatism ➤ Accommodation ➤ Presbyopia ➤ Anisometropia and Aniseikonia ➤ Aphakia and Pseudophakia	9 hours
2.Accommodation ➤ Far and near points of accommodation ➤ Correction of spherical ametropia ➤ Axial versus refractive ametropia ➤ Relationship between accommodation and convergence, AC / A ratio	6 hours
3.Objective refraction ➤ Streak Retinoscopy only	3 Hours
4.Subjective Refraction ➤ Review of subjective refractive methods ➤ Cross cylinder methods for astigmatism, Astigmatic Fan Test ➤ Difficulties in subjective and objective tests and their avoidance ➤ Ocular refraction versus spectacle refraction ➤ Ocular accommodation versus spectacle accommodation ➤ Spectacle magnification and relative spectacle magnification ➤ Retinal image blur; depth of focus and depth of field ➤ Prescribing Prisms / Binocular Refraction	9 hours
Total no. of hours	27 hours

Reference Books:

- A H Tunnacliffe: Visual optics, The Association of British Optician, 1987
- AG Bennett & RB Rabbets: Clinical Visual optics, 3rd edition, Butterworth Heinemann, 1998
- M P Keating: Geometric, Physical and Visual optics, 2nd edition, Butterworth- Heinemann, USA, 2002
- HL Rubin: Optics for clinicians, 2nd edition, Triad publishing company. Florida, 1974.
- H Obstfeld: Optic in Vision- Foundations of visual optics & associated computations, 2nd edition, Butterworth, UK, 1982.

- WJ Benjamin: Borish's clinical refraction, 2nd edition, Butterworth Heinemann, Missouri, USA, 2006
- T Grosvenor: Primary Care Optometry, 4th edition, Butterworth – heinemann, USA, 2002

THIRD YEAR

4. SYSTEMIC DISEASE MEDICINE

No	Topics	Number of Lectures
1	Hypertension ➤ Definition, classification, Epidemiology, clinical examination, complications, and management. ➤ Hypertensive retinopathy	4
2	Diabetes Mellitus ➤ Classification, pathophysiology, clinical presentations, diagnosis, and management, Complications ➤ Diabetic Retinopathy	4
3	Thyroid Disease ➤ Physiology, testing for thyroid disease, Hyperthyroidism, Hypothyroidism, Thyroiditis, Thyroid tumors ➤ Grave's Ophthalmopathy	4
3	Acquired Heart Disease ➤ Ischemic Heart Disease, Congestive heart failure, Disorders of cardiac rhythm ➤ Ophthalmic considerations	4
4	Cancer : ➤ Incidence ➤ Etiology ➤ Therapy ➤ Ophthalmologic considerations	4
5	Connective Tissue Disease ➤ Rheumatic arthritis ➤ Systemic lupus erythematosus ➤ Scleroderma ➤ Polymyositis and dermatomyositis ➤ Sjogren syndrome ➤ Behcet's syndrome ➤ Eye and connective tissue disease	4
6	Tuberculosis ➤ Aetiology, pathology, clinical features, pulmonary tuberculosis, diagnosis, complications, treatment tuberculosis and the eye.	4

7	Herpes virus (Herpes simplex, Varicella Zoster, Cytomegalovirus, Epstein Barr Virus) Herpes and the eye	3
8	Hepatitis (Hepatitis A, B, C)	2
9	Acquired Immunodeficiency Syndrome	4
10	Anemia (Diagnosis, clinical evaluation, consequences, Sickle cell disease, treatment, Ophthalmologic considerations)	2
9	Common Tropical Medical Ailments ➤ Malaria ➤ Typhoid ➤ Dengue ➤ Filariases ➤ Onchocerciasis ➤ Cysticercosis ➤ Leprosy	4
10	Nutritional and Metabolic disorders: ➤ Obesity ➤ Hyperlipidaemias ➤ Kwashiorkor ➤ Vitamin A Deficiency ➤ Vitamin D Deficiency ➤ Vitamin E Deficiency ➤ Vitamin K Deficiency ➤ Vitamin B1,B2, Deficiency ➤ Vitamin C Deficiency	2
11	Myasthenia Gravis	2
12	➤ First Aid ➤ General Medical Emergencies ➤ Preoperative precautions in ocular surgeries	4
13	Psychiatry ➤ Basic knowledge of psychiatric condition and ➤ Patient Management	2
14	Genetics ➤ Introduction to genetics ➤ Organisation of the cell	4

	➤ Chromosome structure and cell division ➤ Gene structure and basic principles of Genetics. ➤ Genetic disorders and their diagnosis. ➤ Genes and the eye ➤ Genetic counseling and genetic engineering. ➤	
	Total Number of Lectures	57

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 KUHS

5. EYE DISEASES

S. No.	Topics	No. of Lectures
1.	a) ORBIT ➤ Applied Anatomy ➤ Proptosis Classification,Causes,Investigations) ➤ Enophthalmos ➤ Developmental Anomalies (craniosynostosis, Craniofacial Dysostosis, Hypertelorism, Median facial cleft syndrome) ➤ Orbital Inflammations (Preseptal cellulites, Orbital cellulitis Orbital Periostitis, cavernous sinus Thrombosis) ➤ Grave's Ophthalmopathy ➤ Orbital tumors(Dermoids, capillary haemangioma, Optic nerve glioma) ➤ Orbital blowout fractures ➤ Orbital surgery (Orbitotomy) ➤ Orbital tumors ➤ Orbital trauma ➤ Approach to a patient with proptosis	10
2.	b) LIDS Applied Anatomy ➤ Congenital anomalies (Ptosis, Coloboma, Epicanthus, Distichiasis, Cryptophthalmos)	6

	➤ 3.Oedema of the eyelids (Inflammatory, Solid, Passive edema) ➤ Inflammatory disorders (Blepharitis, External Hordeolum, Chalazion, ➤ Internal hordeolum,,Molluscum Contagiosum) ➤ Anomalies in the position of the lashes and Lid Margin (Trichiasis, Ectropion, Entropion, Symblepharon, Blepharophimosis, Lagophthalmos, Blepharospasm, Ptosis). ➤ Tumors (Papillomas, Xanthelasma, Haemangioma, Basal carcinoma, Squamous cell carcinoma, sebaceous gland melanoma)	
3.	c) LACRIMAL SYSTEM ➤ Applied Anatomy ➤ Tear Film ➤ The Dry Eye (Sjogren's Syndrome) ➤ The watering eye (Etiology, clinical evaluation) ➤ Dacryocystitis ➤ Swelling of the Lacrimal gland (Dacryoadenitis)	4
4.	d) CONJUNCTIVA ➤ Applied Anatomy ➤ Inflammations of conjunctiva (Infective conjunctivitis – bacterial, chlamydial, viral , Allergic conjunctivitis, Granulomatous conjunctivitis) ➤ Degenerative conditions ➤ (Pinguecula, Pterygium, Concretions) ➤ Symptomatic conditions ➤ (Hyperaemia, Chemosis, Ecchymosis, Xerosis, Discoloration) ➤ 5.Cysts and Tumors	4
5.	e) CORNEA ➤ Applied Anatomy and Physiology ➤ Congenital Anomalies (Megalocornea, Microcornea, Cornea plana, Congenital cloudy cornea) ➤ Inflammations of the cornea (Topographical classifications: Ulcerative keratitis and Non ulcerative ➤ Etiological classifications: Infective, Allergic, Trophic, Traumatic, Idiopathic) ➤ Degenerations (classifications, Arcus senilis, Vogt's white limbal girdle, Hassal-henle bodies, Lipoid Keratopathy, Band shaped keratopathy, Salzmann's nodular degeneration, Droplet keratopathy, Pellucid Marginal degeneration) ➤ Dystrophies (Reis Buckler dystrophy,Recurrent corneal erosion syndrome, Granualr dystrophy,Lattice dystrophy, Macular dystrophy, cornea guttata, Fuch's epithelial endothelial dystrophy, Congenital hereditary endothelial dystrophy)	12

	➤ Keratoconus, Keratoglobus ➤ Corneal oedema, Corneal opacity, Corneal vascularisation ➤ Penetrating Keratoplasty	
6.	f) UVEAL TRACT AND SCLERA ➤ Applied Anatomy, ➤ Classification of uveitis ➤ Etiology ➤ Pathology ➤ Anterior Uveitis ➤ Posterior Uveitis ➤ Purulent Uveitis ➤ Endophthalmitis ➤ Panophthalmitis ➤ Pars Planitis ➤ Tumors of uveal tract(Melanoma) ➤ Episcleritis and scleritis ➤ Clinical examination of Uveitis and Scleritis	10
7.	Retina and Vitreous: ➤ Applied Anatomy ➤ Congenital and Developmental Disorders (Optic Disc: Coloboma, Drusen, Hypoplasia, Medullated nerve fibers; Persistent Hyaloid Artery) ➤ Inflammatory disorders (Retinitis : Acute purulent , Bacterial, Virus, mycotic) ➤ Retinal Vasculitis (Eales's) ➤ Retinal Artery Occlusion (Central retinal Artery occlusion) ➤ Retinal Vein occlusion (Ischaemic, Non Ischaemic , Branch retinal vein occlusion) ➤ Retinal degenerations : Retinitis Pigmentosa, Lattice degenerations ➤ Macular disorders: Solar retinopathy, central serous retinopathy, cystoid macular edema, Age related macular degeneration. ➤ Retinal Detachment: Rhegmatogenous, Tractional, Exudative) ➤ Retinoblastoma	12

8.	Ocular Injuries: Terminology : Closed globe injury (contusion, lamellar laceration) Open globe injury (rupture, laceration, penetrating injury, perforating injury) Mechanical injuries (Extraocular foreign body, blunt trauma, perforating injury, sympathetic ophthalmitis) ➤ Non Mechanical Injuries (Chemical injuries, Thermal, Electrical, Radiational) ➤ Clinical approach towards ocular injury patients	4
9.	Lens ➤ Applied Anatomy and Physiology ➤ Clinical examination ➤ Classification of cataract ➤ Congenital and Developmental cataract ➤ Acquired (Senile, Traumatic, Complicated, Metabolic, Electric, Radiational, Toxic) ➤ Morphological: Capsular, Subcapsular, Cortical, Supranuclear, Nuclear, Polar. ➤ Management of cataract (Non surgical and surgical measures; preoperative evaluation, Types of surgeries,) ➤ Complications of cataract surgery ➤ Displacement of lens: Subluxation, Displacement ➤ Lens coloboma, Lenticonus, Microspherophakia.	10
10.	Clinical Neuro-ophthalmology ➤ Anatomy of visual pathway ➤ Lesions of the visual pathway ➤ Pupillary reflexes and abnormalities (Amaurotic light reflex, Efferent pathway defect, Wernicke's hemianopic pupil, Marcus gunn pupil. Argyll Robertson pupil, Adie's tonic pupil) ➤ Optic neuritis, Anterior Ischemic optic neuropathy, Pappilloedema, optic atrophy ➤ Cortical blindness ➤ Malingering ➤ Nystagmus ➤ Clinical examination	12
11.	Glaucoma ➤ Applied anatomy and physiology of anterior segment ➤ Clinical Examination	10

	➤ Definitions and classification of glaucoma ➤ Pathogenesis of glaucomatous ocular damage ➤ Congenital glaucomas ➤ Primary open angle glaucoma ➤ Ocular hypertension ➤ Normal Tension Glaucoma ➤ Primary angle closure glaucoma (Primary angle closure suspect, Intermittent glaucoma, acute congestive, chronic angle closure) ➤ Secondary Glaucomas ➤ Management : common medications, laser intervention and surgical techniques	
	Total hours	92

1) Reference Books:

- A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007
- [Stephen J. Miller](#) : Parsons Diseases of the Eye, 18th edition, Churchill Livingstone, 1990
- [Jack J. Kanski](#) Clinical Ophthalmology: A Systematic Approach, 6th edition, Butterworth - Heinemann, 2007

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

No.	Topic	No. of Lectures
1	Components of spectacle prescription & interpretation, transposition, Add and near power relation	1
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	1
4	Lens & Frame markings, Pupillary centers, bifocal heights, Progressive markings & adjustments – facial wrap, pantoscopic tilt	1
5	Recording and ordering of lenses (power, add, diameter, base, material, type, lens enhancements)	1
6	Neutralization – Hand & lensometer, axis marking, prism marking	3
7	Faults in spectacles (lens fitting, frame fitting, patients complaints, description, detection and correction)	2
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	1
10	Special types of spectacle frames ➤ Monocles ➤ Ptosis crutches ➤ Industrial safety glasses ➤ Welding glasses	1
12	Frame availability in Indian market	2
13	FAQ's by customers and their ideal answers	2
	Total number of Hours	21

Reference Book:

- David Wilson, Steve stenersen: Practical optical workshop, OTEN- DE, NSW TAFE Commission, 2002
- Margaret Dowaliby: Practical Aspects of Ophthalmic optics, Fourth edition, Butterworth Heinemann, USA, 2001
- David Wilson: Practical Optical Dispensing, OTEN- DE, NSW TAFE Commission, 1999

- C V Brooks, IM Borish: System for Ophthalmic Dispensing, Second edition, Butterworth-Heinemann, USA, 1996

CONTACT LENS

No.	Topics	No of Lecture(s)
1.	Introduction to Contact lenses ➤ Definition ➤ Classification / Types	1
2.	History of Contact Lenses	1
3.	Optics of Contact Lenses ➤ Magnification & Visual field ➤ Accommodation & Convergence ➤ Back & Front Vertex Power / Vertex distance calculation	3
4.	Review of Anatomy & Physiology of ➤ Tear film ➤ Cornea ➤ Lids & Conjunctiva	2
5.	Introduction to CL materials ➤ Monomers, Polymers	2
6.	Properties of CL materials ➤ Physiological (Dk, Ionicity, Water content) ➤ Physical (Elasticity, Tensile strength, Rigidity) ➤ Optical (Transmission, Refractive index)	3
7.	Indications and contraindications	2
8.	Parameters / Designs of Contact Lenses & Terminology	3
9.	RGP Contact Lens materials	1
10.	Manufacturing Rigid and Soft Contact Lenses – various methods	1
11.	Pre-Fitting examination – steps, significance, recording of results	3
12.	Correction of Astigmatism with RGP lens	2

13.	Types of fit – Steep, Flat, Optimum – on spherical cornea with spherical lenses	1
14.	Types of fit – Steep, Flat, Optimum – on Toric cornea with spherical lenses	1
15.	Calculation and finalising Contact lens parameters	1
16.	Ordering Rigid Contact Lenses – writing a prescription to the Laboratory	1
17.	Checking and verifying Contact lenses from Laboratory	1
18.	Modifications possible with Rigid lenses	1
19.	Common Handling Instructions ➤ Insertion & Removal Techniques ➤ Do's and Dont's	1
20.	Care and Maintenance of Rigid lenses ➤ Cleaning agents & Importance ➤ Rinsing agents & Importance ➤ Disinfecting agents & importance ➤ Lubricating & Enzymatic cleaners	3
21.	Follow up visit examination	1
22.	Complications of RGP lenses	2
23.	SCL Materials & Review of manufacturing techniques	2
24.	Comparison of RGP vs. SCL	1
25.	Pre-fitting considerations for SCL	2
26.	Fitting philosophies for SCL	1
27.	SCL fitting assessment	2
28.	Types of fit – Steep, Flat, Optimum	3
29.	Calculation and finalising SCL parameters	2
30.	Disposable lenses a) Advantages and availability	1
31.	Soft Toric CL ➤ Stabilization techniques ➤ Parameter selection	2

	➤ Fitting assessment	
32.	Common Handling Instructions ➤ Insertion & Removal Techniques ➤ Do's and Dont's	1
33.	Care and Maintenance of Soft lenses ➤ Cleaning agents & Importance ➤ Rinsing agents & Importance ➤ Disinfecting agents & importance ➤ Lubricating & Enzymatic cleaners	2
34.	Follow up visit examination	2
35.	Complications of Soft lenses	4
36.	Therapeutic contact lenses ➤ Indications ➤ Fitting consideration	1
37.	Specialty fitting ➤ Aphakia ➤ Pediatric ➤ Post refractive surgery	3
38.	Introduction to Bifocal CL	1
	Total Number of lectures	67

Reference Books

- IACLE modules 1 - 10
- CLAO Volumes 1, 2, 3
- [Anthony J. Phillips](#) : Contact Lenses, 5th edition, Butterworth-Heinemann, 2006
- [Elisabeth A. W. Millis](#): Medical Contact Lens Practice, Butterworth-Heinemann, 2004
- [E S. Bennett](#) , [V A Henry](#) :Clinical manual of Contact Lenses, 3rd edition, Lippincott Williams and Wilkins, 2008

LOW VISION AID

	Topics	Number of lectures
1	Definitions & classification of Low vision	1
2	Epidemiology of low vision Model of low vision service	1
3	Pre-clinical evaluation of low vision patients – prognostic & psychological factors; psycho-social impact of low vision	1
4	Types of low vision aids – optical aids, non-optical aids & electronic devices	3
5	Optics of low vision aids	1
6	Clinical evaluation – assessment of visual acuity, visual field, selection of low vision aids, instruction & training	3
7	Pediatric Low Vision care	4
8	Low vision aids – dispensing & prescribing aspects	1
9	Visual rehabilitation & counseling	1
10	Legal aspects of Low vision in India	1
11	Case Analysis	5
	Total hours	21

Reference Books:

- [Richard L. Brilliant](#): Essentials of Low Vision Practice, Butterworth-Heinemann, 1999
- Helen Farral: optometric Management of Visual Handicap, Blackwell Scientific publications, 1991
- A J Jackson, J S Wolffsohn: Low Vision Manual, Butterworth Heinemann, 2007
- [Christine Dickinson](#): Low Vision: Principles and Practice Low vision care, 4th edition, Butterworth-Heinemann, 1998
- E Vaithilingam: practice of Low vision – A guide book, Medical Research Foundation, 2000.

7. BINOCULAR VISION & SQUINT

No.	Name of the topic	Number of lectures
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.	6
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	4

3.	Near Vision Complex Accommodation ➤ Definition and mechanism (process). ➤ Methods of measurement. ➤ Stimulus and innervation. ➤ Types of accommodation. ➤ Anomalies of accommodation – aetiology and management.	3
4.	Convergence ➤ Definition and mechanism. ➤ Methods of measurement. ➤ Types and components of convergence - Tonic, accommodative, fusional, proximal. ➤ Anomalies of Convergence – aetiology and management.	5
5.	Sensory adaptations Confusion	1
6.	Suppression Investigations Management Blind spot syndrome	4
7.	Abnormal Retinal Correspondence Investigation and management Blind spot syndrome	1
8.	Eccentric Fixation Investigation and management	1
9.	Amblyopia Classification Aetiology Investigation Management	4
10	Neuro-muscular anomalies Classification and etiological factors	1
11	History – recording and significance.	1
12	Convergent strabismus ➤ Accommodative convergent squint ➤ Classification ➤ Investigation and Management ➤ B Non accommodative Convergent squint ➤ Classification	4

	➤ Investigation and Management	
13	Divergent Strabismus Classification A& V phenomenon Investigation and Management	3
14	Vertical strabismus Classification Investigation and Management	1
15	Paralytic Strabismus Acquired and Congenital Clinical Characteristics Distinction from comitant and restrictive Squint	3
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	2
18	Restrictive Strabismus Features ➤ Musculo fascical anomalies ➤ Duane's Retraction syndrome ➤ Clinical features and management ➤ Brown's Superior oblique sheath syndrome ➤ Strabismus fixus ➤ Congenital muscle fibrosis	3

19	Surgical management	1
	Total Number of Hours	60

Reference Books

- Pradeep Sharma: Strabismus simplified, New Delhi, First edition, 1999, Modern publishers.
- Fiona J. Rowe: Clinical Orthoptics, second edition, 2004, Blackwell Science Ltd
- Gunter K. Von Noorden: BURIAN- VON NOORDEN'S Binocular vision and ocular motility theory and management of strabismus, Missouri, Second edition, 1980, C. V. Mosby Company
- Mitchell Scheiman; Bruce Wick: [Clinical Management of Binocular Vision](#) Heterophoric, Accommodative, and Eye Movement Disorders, 2008, Lippincot Williams & Wilkins publishers

8. COMMUNITY OPTOMETRY

Unit 1

PAEDIATRIC, GERIATRIC OPTOMETRY

No	Topics	Number of Lectures
1	The Development of Eye and Vision	2
2	History taking Paediatric subjects	2
3	Assessment of visual acuity	1
4	Normal appearance, pathology and structural anomalies of	2
	a) Orbit, Eye lids, Lacrimal system,	
	b) Conjunctiva, Cornea, Sclera	2
	Anterior chamber, Uveal tract, Pupil	
	c) Lens, vitreous, Fundus	1

	Oculomotor system	
5	Refractive Examination	2
6	Determining binocular status	1
7	Determining sensory motor adaptability	1
8	Compensatory treatment and remedial therapy for : Myopia, Pseudomyopia, Hyperopia, Astigmatism, Anisometropia, Amblyopia	2
9	Remedial and Compensatory treatment of Strabismus and Nystagmus	2
10	Paediatric eye disorders : Cataract, Retinopathy of Prematurity, Retinoblastoma, Neuromuscular conditions (myotonic dystrophy, mitochondrial cytopathy), and Genetics	3
11	Anterior segment dysgenesis, Aniridia, Microphthalmos, Coloboma, Albinism	2
12	Spectacle dispensing for children	3
13	Paediatric contact lenses	2
14	Low vision assessment in children	2
	Total Number of Lectures	30

References:

- Binocular Vision and Ocular Motility - VON NOORDEN G K Burian Von Noorden's, 2nd Ed., C.V.Mosby Co. St. Louis, 1980.
- Assessing Children's Vision. By Susan J Leat, Rosalyn H Shute, Carol A Westall.45 Oxford: Butterworth-Heinemann, 1999.
- Clinical pediatric optometry. LJ Press, BD Moore, Butterworth- Heinemann, 1993
- Pediatric Optometry - JEROME ROSNER, Butterworth, London 1982
- Paediatric Optometry – William Harvey/ Bernard Gilmartin, Butterworth –Heinemann, 2004

GERIATRIC OPTOMETRY

No.	Topics	Number of Lectures
1	Structural , and morphological changes of eye in elderly	2
2	Physiological changes in eye in the course of aging.	2
3	Introduction to geriatric medicine – epidemiology , need for optometry care, systemic diseases (Hypertension, Atherosclerosis, coronary heart disease, congestive Heart failure, Cerebrovascular disease, Diabetes, COPD)	3
4	Optometric Examination of the Older Adult	2
5	Ocular diseases common in old eye, with special reference to cataract, glaucoma, macular disorders, vascular diseases of the eye	4
6	Contact lenses in elderly	1
7	Pharmacological aspects of aging	2
8	Low vision causes, management and rehabilitation in geriatrics.	4
9	Spectacle dispensing in elderly – Considerations of spectacle lenses and frames	4
	Total Number of Lectures	25

Reference Books:

- OP Sharma: Geriatric Care – A textbook of geriatrics and Gerontology, viva books, New Delhi, 2005
- VS Natarajan: An update on Geriatrics, Sakthi Pathipagam, Chennai, 1998
- DE Rosenblatt, VS Natarajan: Primer on geriatric Care A clinical approach to the older patient, Printers Castle, Cochin, 2002
- A.J. ROSSENBLOOM Jr & M.W.MORGAN: Vision and Aging, Butterworth-Heinemann, Missouri, 2007.

Unit 2

PUBLIC HEALTH & COMMUNITY OPTOMETRY

No.	Topics	No of Lectures
1	Public Health Optometry: Concepts and implementation	1
2	Dimensions, determinants and indicators of health	1
3	Levels of disease prevention and levels of health care patterns	1
4	Epidemiology of blindness – Defining blindness and visual impairment	1
5	Eye in primary health care	1
6	Contrasting between Clinical and community health programs	2
7	Community Eye Care Programs	4
8	Community based rehabilitation programs	2
9	Nutritional Blindness with reference to Vitamin A deficiency	1
10	Vision 2020: The Right to Sight	3
11	Screening for eye diseases	4
12	National and International health agencies, NPCB	2

13	Role of an optometrist in Public Health	1
14	Organization and Management of Eye Care Programs – Service Delivery models	1
15	Health manpower and planning & Health Economics	1
16	Evaluation and assessment of health programmes	1
17	Optometrists role in school eye health programmes	1
18	Basics of Tele Optometry and its application in Public Health	2
19	Information, Education and Communication for Eye Care programs	1
	Total Lectures	26

Reference books:

- MC Gupta, Mahajan BK, Murthy GVS, 3rd edition. Text Book of Community Medicine, Jaypee Brothers, New Delhi, 2002
- GVS Murthy, S K Gupta, D Bachani: The principles and practice of community Ophthalmology, National programme for control of blindness, New Delhi, 2002
- Newcomb RD, Jolley JL : Public Health and Community Optometry, Charles C Thomas Publisher, Illinois, 1980
- K Park: Park's Text Book of Preventive and Social Medicine, 19th edition,
- Banarsidas Bhanot publishers, Jabalpur, 2007

Unit 3

OCCUPATIONAL HEALTH OPTOMETRY

No.	Topics	No of Lectures
1	Introduction to Occupational health, hygiene and safety, international bodies like ILO, WHO, National bodies etc Acts and Rules - Factories Act, WCA,ESI Act.	2
2	Electromagnetic Radiation and its effects on Eye	2
3	Light – Definitions and units, Sources, advantages and disadvantages, standards	2
4	Color – Definition, Color theory, Color coding, Color defects, Color Vision tests	2
5	Occupational hazards and preventive/protective methods	2
5	Task Analysis	2
6	Industrial Vision Screening – Modified clinical method and Industrial Vision test	2
4	Vision Standards – Railways, Roadways, Airlines	2
5	Visual Display Units	2
6	Contact lens and work	2
	TOTAL NO. OF LECTURES	20

Reference books:

- R V North: Work and the eye, Second edition, Butterworth Heinemann, 2001
- G W Good: Occupational Vision Manual available in the following website: www.aoa.org
- N.A. Smith: Lighting for Occupational Optometry, HHSC Handbook Series, Safchem Services, 1999
- J Anshel: Visual Ergonomics Handbook, CRC Press, 2005
- G Carson, S Doshi, W Harvey: Eye Essentials: Environmental & Occupational Optometry, Butterworth-Heinemann, 2008

Unit 4

LAW AND OPTOMETRY

- Laws governing medical and paramedical professions
- Consumer act with respect to optometry and dispensing optical aids
- International optometry – Important foreign optometry law
- Personal and professional Insurance(indemnity)
- Employment and contacts
- Partnership and alternatives
- Ethics
- Negligence
- Laws governing practice of medical profession and para-medical profession In India
- Registered medical practitioner – laws against practice of medicine of those unregistered – Medical Council of India – Dental Council – Nursing council
- Present rules and regulations – Laws regarding optical product manufacturers – dispensing in India

Unit 5

THEATRE TECHNIQUES & STERILIZATION TECHNIQUES

- Staffing and categories of people in OT
- Physical set up and general function of OT
- Operation table, anesthetic table, preparation of eye pad, cotton swab
- General procedures, setting up of sterile trolley, scrubbing gowning, gloving
- Sterilization and disinfection-Boiling, autoclaving dry heat, chemical disinfection
- Surgical instruments- general and ophthalmic, specifications and use of ophthalmic surgical instruments. Cleaning and maintenance of surgical instruments.

- Common ophthalmic surgeries, setting up of instruments for common eye surgeries
- Preparation of patients for eye surgeries
- Anesthesia, type, general local spinal etc , Retro bulbar

2.10 Content of each subject in each year

FIRST YEAR

Internal Examination only

- English
- Mathematics
- Basics in applied Chemistry

University Examination

- Physical Optics & Geometrical Optics
- General Anatomy
- Ocular Anatomy
- General Physiology
- Ocular Physiology

SECOND YEAR

Internal Examination only

- Information Technology

University Examination

- Nutrition & Biochemistry
- Pharmacology
- Microbiology
- Pathology

- Optometric Optics
- Clinical Examination of Visual System & Instruments
- Visual Optics

CLINICS – 18 hours / week

THIRD YEAR

Internal Examination only

- Systemic Diseases Medicine
- Project

University Examination

- Eye Diseases
- Contact Lens
- Low Vision aid , Dispensing Optics & Mechanical Optics
- Binocular Vision & Squint
- Community Optometry

CLINICS– 20 hours / week

FOURTH YEAR

Project work may be done in the training period (internship), as two separate projects. The projects will be monitored by the HOD with appropriate guidance.

Project 1 will be scientific study

Project 2 will be a community based study.

Specialty training

Speciality training may be carried out in the following at the discretion of the Head of Department and availability of resources

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)

2.11 No: of hours per subject

As per [“Teaching learning methods “ and “Content of each subject in each year “] above.

2.12 Practical training

As per [“Teaching learning methods “ and “Content of each subject in each year “] above.

2.13 Records :

To be maintained for all Practical Work

2.14 Dissertation:

Not Applicable

2.15 Speciality training if any

As per [“Teaching learning methods “ and “Content of each subject in each year “] above.

2.16 Project work to be done if any

As stipulated by the HoD if necessary.

2.17 Any other requirements [CME, Paper Publishing etc.]

Not Applicable

2.18 Prescribed/recommended textbooks for each subject

As per [“Teaching learning methods “ and “Content of each subject in each year “] above.

2.19 Reference books

As per [“Teaching learning methods “ and “Content of each subject in each year “] above.

2.20 Journals:

As decided by the HoD.

2.21 Logbook :To be maintained for all academic work and shall be countersigned by the concerned HOD.

3. EXAMINATIONS

3.1 Eligibility to appear for exams [including Supplementary]

Each candidate should put in minimum 80% of attendance in theory and clinical practical separately for appearing university examination. There shall be three Sessional examinations, the final one in the University model and is mandatory to appear. The average of the highest two marks shall be taken as the internal assessment mark.

The candidate must secure a minimum of 50% marks for internal assessment in a particular subject in theory and practical separately, in order to be eligible to appear in the university examination of the subject.

Attendance and condonation

Each candidate should put in minimum 80% of attendance in theory and practical separately for each subject to appear in university examination. Condonation of 10% in the attendance once in the entire course period can be granted by the Head of the Institution in consultation with HOD and the same may be communicated to the university along with prescribed fee , and a declaration that the student has not availed the facility in the previous years. There shall be a register for recording the details of condonation granted to students which is subject to periodic verification by KUHS.

3.2 Schedule of Regular/Supplementary exams

There will be two examinations one regular and one supplementary in an academic year.

The supplementary examinations shall be conducted within 6 months after declaration of results.

A student fails either in theory or practical shall appear for both theory and practical again.

3.3 Scheme of examination showing maximum marks and minimum marks

First year: -The subject English Language will be having two internal examinations.

1st Semester - 50 marks

2nd Semester – 50 marks

First year 1st semester – Internal Assessment only

Sl. No	Subject	Marks	
		Max.	Min.
1	English	50	25
2	Mathematics	40	20
3	Chemistry	40	20
4	Physics	10	-
5	General Anatomy	10	-
6	Ocular Anatomy	10	-
7	General Physiology	10	-
8	Ocular Physiology	10	-

First year 2nd semester – University Examination

Sl. No	Subject	IA Max	IA Min	University Theory Examination		Total	
				Max.	Min.	Max.	Min.
1	Anatomy Section – A – General Anatomy						

	Anatomy - Section – B – Ocular Anatomy	20	10	80	40	100	50
2	Physiology – Section – A – General Physiology	20	10	80	40	100	50
	Physiology - Section – B – Ocular Physiology						
3	Physical Optics & Geometrical Optics	20	10	80	40	100	50
Grand Total – First year						300	

Second Year [3rd Semester] Internal Assessment only

Sl. No	Subject	Marks Max.	Mark Min.
1	Information Technology	40	20
2	Nutrition and Biochemistry	10	-
3	Pharmacology	10	-
4	Microbiology	10	-
5	Pathology	10	-
6	Clinical Examination of visual system and instruments	10	-
7	Visual optics	10	-
8	Optometric optics	10	-
Total		110	-

Second Year [4th Semester] University Examination

Sl. No	Subject	IA Max	IA Min.	Uty.Theory Ex. Max. Min		University Practical		IA Max	IA Min.	Total Max min	
1	Paper I – Section A – Nutrition & Biochemistry	20	10	80	40	No practical examination		-	-	100	50
	No practical examination					-	-				
Note : Examination of Paper I Section A and B can be conducted in separate days											
2	Paper II – Section A - Pathology	20	10	80	40	No practical examination		-	-	100	50
	No practical examination					-	-				
3	Clinical Examination of visual systems and ophthalmic instruments	10	5	40	20	40	20	10	5	100	50
4	Visual Optics	10	5	40	20	40	20	10	5	100	50
5	Optometric Optics	10	5	40	20	40	20	10	5	100	50
Grand Total – Second year										500	

Final year – 5th Semester – Internal Assessment only

Sl. No	Subject	Marks Max	Min
1	General Medicine	10	5
2	Eye Diseases	10	-
3	Contact lens	10	-

4	Low Vision and Dispensing optics & mechanical optics	10	-
5	Squint and orthoptics	10	-
6	Community optometry	10	-
Total		50	-

Final Year [6th Semester] – University Examination

Sl. No	Subject	IA Max	IA Min.	Uty.Theory Ex.		University Practical Exam		IA Max	IA Min.	Total	
				Max.	Min	Max.	Min			Max.	Min
1	Eye Diseases	10	5	40	20	40	20	10	5	100	50
2	Contact lens	10	5	40	20	40	20	10	5	100	50
3	Low vision and Dispensing optics& Mechanical optics	10	5	40	20	40	20	10	5	100	50
4	Squint and orthoptics	10	5	40	20	40	20	10	5	100	50
5	Community Optometry	10	5	40	20	40	20	10	5	100	50
6	Project	Internal examination only								100	50
Grand Total – Third Year										600	

Pattern of Internal Assessment for subjects English, Mathematics, Basics in Applied Chemistry, Information Technology and General Medicine

Internal Examinations will be conducted at the respective institutions in the following pattern.

Sl. No	Subject	Semester	Max. Marks
1	English	1 & 2	50+50 = 100
2	Mathematics	1	40
3	Basics in Applied Chemistry	1	40
3	IT	3	40
4	General Medicine	5	10

* In order to register for the regular examination of KUHS in the 3rd year of the course [final year] all students need to pass all the papers of 1st & 2nd years of the course.

3.4 Papers in each year:

As given under “Teaching learning methods “ and “Content of each subject in each year “ above

3.5 Details of theory exams [include number of papers, Duration, Type of questions & number of questions and marks]

As per clause 3.3

3.6 Model question paper for each subject with question paper pattern

Reg. No.:.....

First BSc OPTOMETRY EXAMINATION (Model Question Paper)

General Science

Time: 3 hrs

Maximum marks: 80

- Answer all questions
- Draw diagrams wherever necessary
- Write Section A and Section B in separate answer books. Do not mix up questions from Section A and Section B

QP Code:

Section A: Physics

Marks: 40

Essay

(10)

1. What is simple harmonic motion? Derive an expression for total energy of simple harmonic motion. Derive an expression for composition of simple harmonic motion in a straight line.

Short notes

(5x3=15)

2. Sign convention used in geometric optics.
3. Define Coma and how it can be eliminated.
4. Explain the principle of holography

Answer briefly

(2x5=10)

5. Characteristic properties of laser
6. State Malu's law
7. Explain the third order theory
8. Focal points
9. Explain Raman scattering

Fill in the blanks

(1x5=5)

10. The velocity of IR is -----.
11. LASER originated as an acronym for -----.
12. SI unit of luminosity is -----.
13. Formation of colors in thin films is due to -----.
14. The lens in human body is a ----- lens.

QP Code:

Section B: Chemistry

Marks:40

Essay

(10)

1. Discuss the shapes of methane, ethane, ethene and ethyne in terms of hybridisation

Short notes

(5x3=15)

2. Describe the various methods for resolution of racemic mixtures
3. Thin layer chromatography.
4. Discuss the molecular structure of benzene

Answer briefly

(2x5=10)

5. Explain the electrometric effect with example.
6. The preparation of sulphapyridine
7. Define the term elution and eluent
8. What are the biochemical functions of vitamin B12
9. Draw the optical isomers of lactic acid

Fill in the blanks

(1x5=5)

10. Homolytic fission of a covalent bond leads to the formation of -----.
11. Glucose reacts with excess of phenyl hydrazine and forms -----.
12. Carbohydrate which is essential constituent of plant cells is -----.
13. ----- is a provitamin for vitamin A.
14. ----- is a carbohydrate found in blood.

Reg. No.:.....

First BSc OPTOMETRY EXAMINATION (Model Question Paper)

Anatomy

Time: 3 hrs

Maximum marks: 80

- Answer all questions
- Draw diagrams wherever necessary
- Write Section A and Section B in separate answer books. Do not mix up questions from Section A and Section B

QP Code:

Section A: General anatomy

Marks:40

Essay

(10)

1. Define cartilage. Mention the different types . Describe them with neat labeled diagrams.

Short notes

(5x3=15)



2. Blood supply of heart.
3. Transitional epithelium
4. Synovial joint

Answer briefly

(2x5=10)

5. Connective tissue fibres
6. Anastomosis of blood vessels
7. Diagram of a typical neuron
8. Simple epithelia with example
9. Smooth muscle

Fill in the blanks

(1x5=5)

10. The gland with both exocrine and endocrine functions is -----.
11. The major constituent of tunica media of large arteries is -----.
12. The cell providing myelin sheath in the central nervous system is -----.
13. The tissue where intercalated disc is seen is -----.
14. The largest organ in the body is -----.

QP Code:

Section B: Ocular anatomy

Marks:40

Essay

(10)

1. Name the extraocular muscles. Describe the actions and nerve supply of each muscle.

Short notes

(5x3=15)

2. Angle of anterior chamber
3. Layers of cornea
4. Lacrimal apparatus

Answer briefly

(2x5=10)

5. Parts of conjunctiva
6. Sphincter pupillae
7. Structure of human lens
8. Draw and label the layers of retina
9. Ophthalmic artery

Fill in the blanks

(1x5=5)

10. The muscle which helps to open the upper lid is -----.
11. The normal depth of anterior chamber is -----.
12. Lens develops from -----.
13. Aqueous is secreted by -----.
14. The sebaceous gland related to tarsus is -----.

Revised (Model Question Paper)

QP Code:

Reg. No.:.....

FIRST BSc OPTOMETRY EXAMINATION

Section A: General Physiology

Time: 3 hrs

Maximum marks: 40

- *Answer all questions*
- *Draw diagrams wherever necessary*

Essay

(1x10=10)

1. Define Cardiac output? What is the normal value? Discuss the factors affecting cardiac output. Add a note on its regulation.

(2+1+3+4=10 marks)

Short notes

(3x5=15)

2. Intrinsic pathway of coagulation.
3. Surfactant.
4. Enterohepatic circulation

Answer briefly

(5x2=10)

5. Functions of platelets.
6. REM sleep
7. Dwarfism
8. Dead space
9. Juxtaglomerular Apparatus

One word answer

(5x1=5)

10. Normal value of Serum Calcium.....
11. Normal Arterial Oxygen Concentration
12. Normal Resting Membrane Potential in a Neuron
13. Normal Hemoglobin value in male
14. Cells which nourish the developing sperms

(Model Question Paper)

QP Code:

Reg. No.:.....

FIRST BSc OPTOMETRY EXAMINATION

Section B: Ocular Physiology

Time: 3hrs

Maximum marks: 40

- *Answer all questions*
- *Draw diagrams wherever necessary*

Essay (1x15=10)

- 1 a. Draw and label the Visual pathway.
- b. What is the normal intra ocular pressure?
- c. Briefly explain Glaucoma.

[4+2+4 = 10 marks]

Short notes (3x5=15)

2. Dark Adaptation

3. Reduced Eye of Listing
4. Homonymous hemianopia

Answer briefly (5x2=10)

5. Electro Retinogram
6. Indirect Light Reflex
7. Functions of Tears
8. Cataract
9. Rhodopsin

One word answer (5x1=5)

10. The Primary Visual area is
11. Refractive index of Cornea is..... [specify units]
12. Normal Intraocular Pressure is[specify units]
13. Expansion of 'LASER'
14. In Argyll Robertson Pupil,reflex is ABSENT.

QP Code:

Reg. No.:.....

SECOND BSc OPTOMETRY FINAL AVERAGE EXAMINATION (Model Question Paper)

Optometric Optics

Time: 2 hrs

Maximum marks: 40

Answer all questions

Draw diagrams wherever necessary

Essays

(1x10=10)

1. Define bifocal spectacle lenses. Describe the types of bifocals. Add a note on trifocals.

Short notes

(3x5=15)

2. Lens faults and types
3. The effective power of a thin lens
4. Abbevalue. Derive the equation $ChAb = P/V$

Answer briefly

(5x2=10)

5. Fresnel prism
6. Materials used for ophthalmic lenses

7. Spectacle magnifier
8. Field of view of ophthalmic lenses
9. Calculate the prismatic effect at NV point of prescription -3.00DC in RE and -5.00DC in LE, add is +3.00. The near optic centre is 8mm below and 2.5mm in, the segment top is 4mm below from distance optic centre.

One word answer

(5x1=5)

10. The size of abrasive using during polishing is-----.
11. Photo chromic filters contain microscopic crystals of -----.
12. Jack in the box phenomenon seen with the use of high convex lens is due to-----.
13. Fitting of lens into the frame is called-----.
14. Chemical name of CR-39 is -----.

QP Code:

Reg. No.:.....

SECOND BSc OPTOMETRY FINAL AVERAGE EXAMINATION (Model Question Paper)

Clinical Examination of Visual System and Ophthalmic Instruments

Time: 2 hrs

Maximum marks: 40

Answer all questions

Draw diagrams wherever necessary

Essays

(1x10=10)

1. Measurement of visual acuity in school children and adults. Briefly outline the principles of Snellen's test types.

Short notes

(3x5=15)

2. History taking of an ophthalmic case.
3. Examination of intra ocular pressure. Mention different methods.
4. Examination of lacrimal system.

Answer briefly

(5x2=10)

5. CC CARD
6. Slit lamp, adjustment and illuminations.
7. Colour vision testing devices.

8. Types of retinoscopes.
9. Examination of cornea

One word answer

(5x1=5)

10. RAF rule is used for
11. Prism bars are used for.....
12. Types of ophthalmoscopes.
13. Bjerrum's screen is used for.....
14. Definition of visual field.....

QP Code:

Reg. No.:.....

SECOND BSc OPTOMETRY FINAL AVERAGE EXAMINATION (Model Question Paper)

Visual optics

Time: 2 hrs

Maximum marks: 40

Answer all questions

Draw diagrams wherever necessary

Essays

(1x10=10)

1. Define retinoscopy. Describe the optics of the stages of retinoscopy in detail.

Short notes

(3x5=15)

2. Draw the schematic representation of reduced eye and mark the cardinal points.
Add a note on Gullstrand's indices.
3. Presbyopia
4. Knaps rule and its application.

Answer briefly

(5x2=10)

5. Far point
6. Do the toric transpositions of +3.50 DS / +2.00 D cyl x 180 (Base curve + 6.00 and - 6.00)
7. Acquired myopia
8. Principle of Bausch and Lomb keratometer.
9. Duo chrome test.

One word answer

(5x1=5)

10. The equation $R=1.22 \lambda / d$ representing Airy disc diameter is related to -----.
11. Straddling is used to refine -----.
12. Myopia more than ----- is referred to as pathological myopia
13. The Scheiner principle is used in -----.
14. The cycloplegic effect of atropine lasts for -----days.

Reg. No.:.....

SECOND BSc OPTOMETRY FINAL AVERAGE EXAMINATION (Model Question Paper)

Microbiology & Pathology

Time: 3 hrs

Maximum marks: 80

- Answer all questions
- Draw diagrams wherever necessary
- Write Section A and Section B in separate answer books. Do not mix up questions from Section A and Section B

QP Code:

Section A: Microbiology

Marks:40

Essay

(15)

2. Discuss the major antigens of HIV (diagram to be included) and the laboratory diagnosis of this virus

Short notes

(2x5=10)

2. Dimorphic fungi and dermatophytes
3. Coagulase test

Answer briefly

(6x2=12)

4. Methicillin resistant staphylococcus aureus
5. Gram negative bacilli
6. Moraxella catarrhalis

7. Pseudomonas aeruginosa

8. Pnuemococci

9. AFB staining

One word answer

(3x1=3)

10. Catalase negative gram positive cocci

11. Use of KOH mount

12. Drug of choice for gram positive organisms

QP Code:

Section B: Pathology

Marks:40

Essay

(15)

1. Define neoplasm. Enumerate the differences between benign and malignant neoplasms. Mention the common routes of metastasis. Name two malignant tumors of eye (2+6+5+2)

Short notes

(3x5=15)

2. Causes and laboratory findings of iron deficiency anemia
3. Ketone bodies in urine
4. WBC count

Answer briefly

(4x2=8)

5. Types of infarcts
6. Causes of thrombocytopenia
7. Fixation of tissues
8. Primary tuberculosis

One word answer

(2x1=2)

9. Two causes of haematuria
10. Two causes of neutrophilia

QP Code:

Reg. No.:.....

THIRD BSc OPTOMETRY FINAL AVERAGE EXAMINATION (Model Question Paper)

Eye diseases

Time: 2 hrs

Maximum marks: 40

Answer all questions

Draw diagrams wherever necessary

Essays

(1x10=10)

1. Define dacryocystitis. Classify dacryocystitis. Discuss anatomy of lacrimal apparatus. Describe the clinical features, investigations and management of chronic dacryocystitis. (3+3+4=10)

Short notes

(3x5=15)

2. Ptosis
3. Pterygium
4. Features of vitamin A deficiency

Answer briefly

(5x2=10)

5. Types of keratoplasty
6. Ophthalmia neonatorum
7. 4 complications of cataract surgery
8. Stages of primary narrow angle glaucoma
9. 4 causes of proptosis

One word answer

(5x1=5)

10. Adhesion of palpebral and bulbar conjunctiva is called -----.
11. Keratic precipitates are features of -----.
12. Collection of blood in anterior chamber is called -----.
13. Refractive status of aphakic eye is -----.
14. Surgical management of POAG is called -----.

QP Code:

Reg. No.:.....

THIRD BSc OPTOMETRY FINAL AVERAGE EXAMINATION (Model Question Paper)

Community optometry

Time: 2 hrs

Maximum marks: 40

Answer all questions

Draw diagrams wherever necessary

Essays

1. Define and classify biomedical waste. Discuss the waste management and mention its universal precaution. (2+2+3+3=10)

Short notes

(3x5=15)

2. Sterilization by heat
3. School eye screening programme
4. Consumer protection act

Answer briefly

(5x2=10)

5. Retinoblastoma
6. Human resource utilization rate
7. 4 causes of preventable blindness in a child
8. Problems with aphakic glass
9. 4 methods of prevention of occupational diseases

One word answer

(5x1=5)

10. Most common type of congenital cataract is -----.
11. A drug used for general anesthesia is -----.
12. Arithmetic mean is calculated by the formula -----.
13. Central ophthalmic cell of NPCB is headed by -----.
14. Xerophthalmia is due to deficiency of -----.

QP Code:

Reg. No.:.....

THIRD BSc OPTOMETRY FINAL AVERAGE EXAMINATION (Model Question Paper)

Contact lens, Low vision aids and dispensing

Time: 2 hrs

Maximum marks: 40

Answer all questions

Draw diagrams wherever necessary

Essays

1. Classify contact lens material. Discuss the physical properties and chemical composition of contact lens materials. Write a note on new generation materials.
(2+2+3+3=10)

Short notes

(3x5=15)

2. Hand magnifiers
3. Lens replacement schedules for soft contact lens
4. Strategies of visual rehabilitation among patients with peripheral field loss

Answer briefly

(5x2=10)

5. Base curve of a contact lens
6. Fitting triangle
7. Prosthetic contact lens
8. Notex
9. 4 indications for rigid gas permeable lens

One word answer

(5x1=5)

10. Vertex distance compensation is made in case of contact lens of power more than -----

11. Slumping is the method of manufacture of -----.
12. Legal blindness refers to best corrected visual acuity less than ---- in the better eye.
13. Ideal contact lens material for continuous wear is -----.
14. A tear prism height of less than ----- suggests dry eye.

QP Code:

Reg. No.:.....

THIRD BSc OPTOMETRY FINAL AVERAGE EXAMINATION (Model Question Paper)

Squint and BSV

Time: 2 hrs

Maximum marks: 40

Answer all questions

Draw diagrams wherever necessary

Essays

1. Name the extra ocular muscles. Discuss their origin, insertion, nerve supply and actions. Describe motor adaptation to an acute onset squint.
(2+5+3=10)

Short notes

(3x5=15)

2. Features of Restrictive squints
3. Abnormal retinal correspondence
4. TNO test

Answer briefly

(5x2=10)

5. Angle kappa
6. Forced duction test
7. Mobius syndrome
8. Uncrossed diplopia
9. Optokinetic nystagmus

One word answer

(5x1=5)

10. Crossed diplopia is seen in -----.
11. Normal AC/A ratio is -----.
12. The muscle affected in Brown's syndrome is -----.
13. Crowding phenomenon is a feature of -----.
14. Secondary deviation is more than primary deviation in -----.

3.7 Internal assessment component

Minimum three internal examinations shall be conducted in each subject during a year of which the final one is University model examination and is mandatory. The average marks of two best performances shall be taken into consideration for the award of internal

marks. Marks of evaluation by other methods like assignments, seminars, projects etc. can be added to the internal marks. **A candidate must obtain 50% of marks in internal assessment to be eligible to appear the university examination.** The class average of internal assessment marks the whole class should not exceed 75% of maximum marks for regular examination and 80% for supplementary examination. The candidates who have failed to obtain the minimum internal marks should be given another chance to improve their internal assessment mark only before the next scheduled university 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.

3.8 Details of practical examination

As mentioned in item "Papers in each year "

3.9 Number of examiners (Internal & External) and their qualifications

The teachers and examiners should possess qualifications acquired from a University / Institution recognized by KUHS. The teachers should possess post graduate degree from a university recognized by KUHS. To become external/internal examiner a teacher should possess a minimum of three years of post P.G teaching experience in the concerned subject. The following are the faculty qualifications for teaching and becoming and Examiner.

There shall be two examiners – One Internal and External. The External examiners shall be drawn from-another University where a similar course is being conducted.

3.10Details of viva:

As per "Papers in each year "above

4 INTERNSHIP

4.1 Eligibility for internship

Students will be eligible to do internship only after passing all the theory papers and clinical practicum.

Provisional registration-After passing the final year exam before joining for internship all students have to take provisional registration from Kerala state Para medical council .

4.2 Details of internship Training

Duration: Every candidate admitted BSc optometry degree course shall undergo one year of compulsory rotating internship after passing of the final year examinations. No candidate shall be awarded degree certificate without successfully completing one year of internship.

Internship posting: As directed by the HOD.

Maintenance of records by students: Submission of internal works such as journal presentation, case presentation, seminars as per the institutional guidelines is mandatory.

Successful completion- the student must maintain a log book. On completion of each posting the same will have to be certified by the faculty in-charge of the posting for both attendance as well as work done. On completion of all postings, the duly completed log book will be submitted to the Principal / Head of the Institution/programme to be considered as having successfully completed the internship programme.

Extension of internship: Internship shall be extended by the number of days the students remains absent. These extended days of Internship should be completed in the respective external/internal Institution. Any other leave other than eligible leave has to be compensated by extension granted by Principal.

4.3 Model of Internship Mark lists

Internship completion certificate: Issued from the concerned Institution

4.4 Extension rules:

Any other leave other than eligible leave less than 6 months has to be compensated by extension granted by the Principal

Extension of internship: Internship shall be extended by the number of days the students remains absent. These extended days of Internship should be completed in the respective external/internal Institution. Any other leave other than eligible leave has to be compensated by extension granted by Principal. However the course shall be completed within double the duration of the course.

4.5 Details of Training given

Every candidate admitted BSc optometry degree course shall undergo one year of compulsory rotating internship after passing of the final year examinations. No candidate shall be awarded degree certificate without successfully completing one year of internship.

5. ANNEXURES

5.1 Check Lists for Monitoring: Log Book, Seminar Assessment etc. to be formulated by the curriculum committee of the concerned Institution

Q.P Code:

Reg. No:

Third Year B.Sc Optometry Degree Examinations August 2019

Eye Diseases

(2016 Scheme)

(Model Question Paper)

Time: 2 hrs

Max Marks: 40

- **Answer all questions**
- **Draw diagrams wherever necessary**

Essay

(10)

1. Define dacryocystitis. Classify dacryocystitis. Discuss anatomy of lacrimal apparatus. Describe the clinical features, investigations and management of chronic dacryocystitis. (3+3+4)

Short Notes

(3x5=15)

2. Ptosis
3. Pterygium
4. Features of vitamin A deficiency

Answer Briefly

(5x2=10)

5. Types of keratoplasty
6. Ophthalmia neonatorum
7. Four complications of cataract surgery
8. Stages of primary narrow angle glaucoma
9. Four causes of proptosis

One Word Answer

(5x1=5)

10. Adhesion of palpebral and bulbar conjunctiva is called -----.
11. Keratic precipitates are features of -----.
12. Collection of blood in anterior chamber is called -----.
13. Refractive status of aphakic eye is -----.
14. Surgical management of POAG is called -----.

Q.P Code:

Reg. No:

Third Year B.Sc Optometry Degree Examinations August 2019

Community Optometry

(2016 Scheme)

(Model Question Paper)

Time: 2 hrs

Max Marks: 40

- Answer all questions
- Draw diagrams wherever necessary

Essay

(10)

1. Define and classify biomedical waste. Discuss the waste management and mention its universal precaution. (2+2+3+3)

Short Notes

(3x5=15)

2. Sterilization by heat
3. School eye screening programme
4. Consumer protection Act

Answer Briefly

(5x2=10)

5. Retinoblastoma
6. Human resource utilization rate
7. Four causes of preventable blindness in a child
8. Problems with aphakic glass
9. Four methods of prevention of occupational diseases

One Word Answer

(5x1=5)

10. Most common type of congenital cataract is -----.
11. A drug used for general anaesthesia is -----.
12. Arithmetic mean is calculated by the formula -----.
13. Central ophthalmic cell of NPCB is headed by -----.
14. Xerophthalmia is due to deficiency of -----.

Q.P Code:

Reg. No:

Third Year B.Sc Optometry Degree Examinations August 2019

Binocular Vision and Squint

(2016 Scheme)

(Model Question Paper)

Time: 2 hrs

Max marks: 40

- Answer all questions
- Draw diagrams wherever necessary

Essay

(10)

1. Name the extra ocular muscles. Discuss their origin, insertion, nerve supply and actions. Describe motor adaptation to an acute onset squint. (2+5+3)

Short Notes

(3x5=15)

2. Features of restrictive squints
3. Abnormal retinal correspondence
4. TNO test

Answer Briefly

(5x2=10)

5. Angle kappa
6. Forced duction test
7. Mobius syndrome
8. Uncrossed diplopia
9. Optokinetic nystagmus

One Word Answer

(5x1=5)

10. Crossed diplopia is seen in -----.
11. Normal AC/A ratio is -----.
12. The muscle affected in Brown's syndrome is -----.
13. Crowding phenomenon is a feature of -----.
14. Secondary deviation is more than primary deviation in -----.

Q.P Code:

Reg. No:

Third Year B.Sc Optometry Degree Examinations August 2019

Contact Lens

(2016 Scheme)

(Model Question Paper)

Time: 2 hrs

Max marks: 40

- **Answer all questions**
- **Draw diagrams wherever necessary**

Essay

(10)

1. Brief on the toric soft contact lens and its stabilization techniques. Explain its fit assessment.

Short Notes

(3x5=15)

2. Therapeutic contact lenses
3. RGP lens fit assessment
4. Manufacturing of contact lens

Answer Briefly

(5x2=10)

5. Dk and Dk/t
6. Properties of an ideal contact lens material
7. Rule of thumb for soft contact lens
8. CLPC
9. Monovision

One Word Answer

(5x1=5)

10. Name two chemical disinfectants
11. Illumination technique used to observe epithelial micro cysts.
12. According to Holden and Mertz Dk/t required for EW contact lens is -----
13. Name one chelating agent used in contact lens care products.
14. In closed eye condition stroma receives oxygen from -----.

Q.P Code:

Reg. No:

Third Year B.Sc Optometry Degree Examinations August 2019

Low Vision & Dispensing Optics & Mechanical Optics

**(2016 Scheme)
(Model Question Paper)**

Time: 2 hrs

Max marks: 40

- Answer all questions
- Draw diagrams wherever necessary

Essay

(10)

1. What are the various optical devices used for low vision patient.

Short Notes

(3x5=15)

2. What is rehabilitation and how to rehabilitate a patient with peripheral visual loss.
3. Faults in spectacle frame fitting
4. Safety eyewear

Answer Briefly

(5x2=10)

5. Relative size devices
6. Name the various types of electronic devices used in low vision patients.
7. Axis marking
8. Pantoscopic tilt & PALs
9. Measurement of D bifocal segment height

One Word Answer

(5x1=5)

10. Notex is ----- non optical device
11. Example of a nose pad type is.....
12. Four point touch is used to verify
13.is a brand which manufactures photochromic lenses.
14.is ANSI standard for industrial eye wear .

Q.P Code:

Reg. No:

Third Year B.Sc Optometry Degree Examinations August 2019

Eye Diseases

(2016 Scheme)

(Model Question Paper)

Time: 2 hrs

Max Marks: 40

- **Answer all questions**
- **Draw diagrams wherever necessary**

Essay

(10)

1. Define dacryocystitis. Classify dacryocystitis. Discuss anatomy of lacrimal apparatus. Describe the clinical features, investigations and management of chronic dacryocystitis. (3+3+4)

Short Notes

(3x5=15)

2. Ptosis
3. Pterygium
4. Features of vitamin A deficiency

Answer Briefly

(5x2=10)

5. Types of keratoplasty
6. Ophthalmia neonatorum
7. Four complications of cataract surgery
8. Stages of primary narrow angle glaucoma
9. Four causes of proptosis

One Word Answer

(5x1=5)

10. Adhesion of palpebral and bulbar conjunctiva is called -----.
11. Keratic precipitates are features of -----.
12. Collection of blood in anterior chamber is called -----.
13. Refractive status of aphakic eye is -----.
14. Surgical management of POAG is called -----.

Q.P Code:

Reg. No:

Third Year B.Sc Optometry Degree Examinations August 2019

Community Optometry

(2016 Scheme)

(Model Question Paper)

Time: 2 hrs

Max Marks: 40

- **Answer all questions**
- **Draw diagrams wherever necessary**

Essay

(10)

1. Define and classify biomedical waste. Discuss the waste management and mention its universal precaution. (2+2+3+3)

Short Notes

(3x5=15)

2. Sterilization by heat
3. School eye screening programme
4. Consumer protection Act

Answer Briefly

(5x2=10)

5. Retinoblastoma
6. Human resource utilization rate
7. Four causes of preventable blindness in a child
8. Problems with aphakic glass
9. Four methods of prevention of occupational diseases

One Word Answer

(5x1=5)

10. Most common type of congenital cataract is -----.
11. A drug used for general anaesthesia is -----.
12. Arithmetic mean is calculated by the formula -----.
13. Central ophthalmic cell of NPCB is headed by -----.
14. Xerophthalmia is due to deficiency of -----.

Q.P Code:

Reg. No:

Third Year B.Sc Optometry Degree Examinations August 2019

Binocular Vision and Squint

(2016 Scheme)

(Model Question Paper)

Time: 2 hrs

Max marks: 40

- Answer all questions
- Draw diagrams wherever necessary

Essay

(10)

1. Name the extra ocular muscles. Discuss their origin, insertion, nerve supply and actions. Describe motor adaptation to an acute onset squint. (2+5+3)

Short Notes

(3x5=15)

2. Features of restrictive squints
3. Abnormal retinal correspondence
4. TNO test

Answer Briefly

(5x2=10)

5. Angle kappa
6. Forced duction test
7. Mobius syndrome
8. Uncrossed diplopia
9. Optokinetic nystagmus

One Word Answer

(5x1=5)

10. Crossed diplopia is seen in -----.
11. Normal AC/A ratio is -----.
12. The muscle affected in Brown's syndrome is -----.
13. Crowding phenomenon is a feature of -----.
14. Secondary deviation is more than primary deviation in -----.

Q.P Code:

Reg. No:

Third Year B.Sc Optometry Degree Examinations August 2019

Contact Lens

(2016 Scheme)

(Model Question Paper)

Time: 2 hrs

Max marks: 40

- **Answer all questions**
- **Draw diagrams wherever necessary**

Essay

(10)

1. Brief on the toric soft contact lens and its stabilization techniques. Explain its fit assessment.

Short Notes

(3x5=15)

2. Therapeutic contact lenses
3. RGP lens fit assessment
4. Manufacturing of contact lens

Answer Briefly

(5x2=10)

5. Dk and Dk/t
6. Properties of an ideal contact lens material
7. Rule of thumb for soft contact lens
8. CLPC
9. Monovision

One Word Answer

(5x1=5)

10. Name two chemical disinfectants
11. Illumination technique used to observe epithelial micro cysts.
12. According to holden and Mertz Dk/t required for EW contact lens is -----
13. Name one chelating agent used in contact lens care products.
14. In closed eye condition stroma receives oxygen from -----.

Q.P Code:

Reg. No:

Third Year B.Sc Optometry Degree Examinations August 2019

Low Vision & Dispensing Optics & Mechanical Optics

**(2016 Scheme)
(Model Question Paper)**

Time: 2 hrs

Max marks: 40

- Answer all questions
- Draw diagrams wherever necessary

Essay

(10)

1. What are the various optical devices used for low vision patient.

Short Notes

(3x5=15)

2. What is rehabilitation and how to rehabilitate a patient with peripheral visual loss.
3. Faults in spectacle frame fitting
4. Safety eyewear

Answer Briefly

(5x2=10)

5. Relative size devices
6. Name the various types of electronic devices used in low vision patients.
7. Axis marking
8. Pantoscopic tilt & PALs
9. Measurement of D bifocal segment height

One Word Answer

(5x1=5)

10. Notex is ----- non optical device
11. Example of a nose pad type is.....
12. Four point touch is used to verify
13.is a brand which manufactures photochromic lenses.
14.is ANSI standard for industrial eye wear .
