

**RAMA UNIVERSITY UTTAR PRADESH,  
KANPUR**

**Faculty of Paramedical Sciences**

**4- YEARS B.Sc. PROGRAMME IN  
OPTOMETRY**



**2018-19**

**Ordinance, Rules, Regulations**

**&**

**SYLLABUS**

## INTRODUCTION

Blindness is a major handicap which if not get cared can be curse to a person. Timely diagnosis and referral can prevent most of blindness in the society. Optometry is a profession that has the primary public health responsibility for eliminating uncorrected refractive error (the leading cause of vision impairment globally). Optometry as a profession has the primary public health responsibility for eliminating uncorrected refractive error. To provide excellent vision care to all the people of the country, India needs 116,000 optometrists. India currently has approximately 9,000 4-year trained optometrists and an estimated 30,000 2-year trained eye care personnel. As primary eye care practitioners, optometrists have a vital role in detecting potentially serious eye diseases such as cataract, glaucoma and age-related eye disorders, as well as general health conditions such as hypertension and diabetes, which can cause various eye problems in masses, and their timely referral and in some cases co- management. Optometry can and should play a leading role in eye care provision at the primary level, and can also assist at secondary and tertiary levels where possible, working with ophthalmologists and other eye care providers towards the unified goal of combating blindness.

### PROGRAMME OBJECTIVES

At the end of optometric training the graduate shall be able to;

1. Perform all the Optometric Techniques
2. Use discretely the essential optometry services
3. Manage all types of clinical diagnostic ophthalmic methods
4. Demonstrate skills in handling the modern Optometric instruments.
5. Develop leadership qualities to function effectively as a leader in the optometry environment
6. Render services to the optometric set up and to communicate effectively with the Ophthalmologists and the hospital management.
7. Development of skill and competency in data processing, reporting and maintenance of records & Ophthalmic procedures.
8. Manage the medical record medico legal cases of the hospital patients.

**Programme:** Bachelor of Science in Optometry (B.Sc. Optometry)

**Duration:** Four year Program (Including 1 year internship in the last year)

**Eligibility For Admission:** Intermediate Science (10+2) or equivalent from a recognized board with

- (i) Physics, Chemistry, Zoology, Biology and English,
- (ii) Physics, Chemistry, Biology/Mathematics subjects with on language  
With minimum 50% of the marks in each subject.

**OR**

Pre degree course from a recognized University equivalent to 10+2

**OR**

Lateral Entry to second year for candidates who have passed Diploma in Optometry or similar, and registered with UP state Medical faculty.

- Note:**
1. The candidate must have passed individually in each of principal subjects.
  2. The Candidate who have passed diploma or vocational course through correspondence shall not be eligible for the course.

**Age limit for admission :** Must have attained 17 years of age on 1<sup>st</sup> July.

**Examination:** There shall be yearly Examinations at the end of each academic year according to the academic calendar of the University. This course shall be divided into three professional examinations namely Bachelor in Science Optometry (B.Sc. Optometry) Part-I at the end of first academic year, Bachelor in Science Optometry (B.Sc. Optometry) Part-II at the end of second academic year and Bachelor in Science Optometry (B.Sc. Optometry) Part-III at the end of third academic year.

All the rules will be as per guidelines of Rama University Uttar Pradesh.

The professional examinations shall be in the form of theory papers and practical examinations. The candidate shall be required to appear in every subject as specified in the course structure for each year.

**Duration of Examination :**

Each theory paper shall be of three hours duration.

**Attendance:**

Every candidate should have minimum 70% attendance of total classes held in single academic year to be eligible to appear in university examinations.

**Internal Assessment :**

It will be for theory and practical both. It will be done through the whole year.

Candidate must obtain at least 35% marks in theory and practical separately in internal assessment to be eligible for the annual university examination.

Internal assessment (**Theory**) will be done as follows :

a)	Mid-term and term and Pre University examinations	= 10 marks
b)	Assignments/Projects/Class test/Clinical Presentations	= 05 marks
c)	Attendance (according to %age of attendance)	= 05 marks
	<b>Total</b>	<b>= 20 marks</b>

Internal assessment (**Practical**) shall be done as follows :

a)	Viva voce & Practical	= 10 marks
b)	Day to day performance	= 05 marks
c)	Attendance (in Lab)	= 05 marks
	<b>Total</b>	<b>= 20 marks</b>

(Those subjects in which University practical examination is not held, internal assessment will be done on the basis of theory examination and projects and assignments.) Candidate must obtain at least 35% marks in the theory and practical examination separately in the internal assessment to be eligible for appearing in the professional examination. If a candidate is absent in theory and practical internal assessment examinations, he/she shall be given chance to re-test in the internal assessment evaluation as programmed by the Faculty of Paramedical Sciences with the prior permission of Registrar, Rama University before the conduction of final professional examinations.

**Criteria of passing :** The candidate is declared to have passed University examinations in subjects, if he/she secure 50% of the marks in the theory and 50% marks in the practical separately. For computation of 50% marks in theory and practical, the marks scored in the internal assessment (theory and practical) shall be added to the University conducted theory and practical examination respectively.

**Grace marks :** If a candidate fails in one subject (theory only) in the annual university examination, five grace marks shall be given to the candidate by the university before declaration of the results. Candidate failing in practical examination will be considered as failed.

### **Supplementary Examinations and Carry over benefits:**

A candidate failing in a subject or more than one subject but securing 30% total aggregate marks will be allowed to appear in the university supplementary examination after two months in that subject/ subjects while being permitted to attend classes of the next year (carry over). Those who secure less than 30% total aggregate marks will be required to appear in all subjects. If a candidate securing internal assessment marks less than 35% in theory and practical separately then he/she has to be evaluated again for internal assessment as programmed by the Faculty of Paramedical Sciences with the prior permission of Registrar, Rama University before the conduction of final /Supplementary examinations.

- (a) If the candidate fails in all subjects or fails to appear in the main examination, then his/her session will be shifted back by one year. The candidate will have to take re-admission in the previous year and pay the tuition fees for the academic year. He/she will have to appear in all subjects in the examination and internal assessment.
- (b) Supplementary examinations will be held not earlier than two months and not later than six months from the date of annual university examinations.

**Division :** Candidate shall be awarded division at the end of third (final) academic year as follows:

Percentage of marks will be calculated from aggregate of total marks obtained in all the three professional examinations.

- (i) Honours – 75% marks and above in total aggregate.
- (ii) Distinction – 75% and above marks in any subject.
- (iii) First Division - 60% and above in the aggregate marks of all subjects.
- (iv) Second Division – 50% or more but less than 60% in the aggregate of marks of all subjects.

### **INTERNSHIP**

A candidate has to undergo internship for a period of 12 months in Medical College, a Govt. hospital/ private hospital/ Tertiary center, which fulfill the norms decided by the University. Internship is a phase of training wherein a graduate is expected to conduct actual practice of Optometry/Ophthalmology and acquires skills under supervision so that he /she may become capable of functioning independently.

- There shall be One year of Internship after the final year examination for candidates declared to have passed the examination in all the subjects.
- During the internship candidate shall have to work full time average 7 hours per day (each working day) for 12 Calendar months.
- Each candidate is allowed maximum of 12 holidays during entire Internship Program and in case of any exigencies during which the candidate remains absent for a period more than 12 days, he/she will have to work for the extra days during which the candidate has remained absent.
- The Internship should be rotatory and cover various Sub-disciplines of optometry/ophthalmology and community optometry.

## **INTERNSHIP SCHEDULE:**

- ❖ Candidate shall be posted to Rotational Clinical assignments of total 12 months or 1 year, including administrative skills pertaining to Optometry/Ophthalmology. The schedule of Internship shall be as follows:

<b>Assignment</b>	<b>Duration</b>
General and Clinical OPD and Indoor	2 months
Refraction and Optical services	2 months
Orthoptics	2 months
Low vision aids clinics	2 months
Community Optometry	2 months
Diagnostics and minor OT procedures	2 months

- ❖ Duration in different discipline can be changed/modified by the head of the institute as per requirements in some special situations.
  - Based on the attendance and work done during posting the Director/Principal/ head of institution/department shall issue '**Certificate of Satisfactory Completion**' of internship training following which the University shall award the B.Sc. Optometry Degree or declare the candidate eligible for the same.
  - **No candidate shall be awarded degree without successfully completing 12 months internship.**
  - Institution shall have to satisfy themselves that satisfactory infrastructure facilities of Clinical Ophthalmology and practical Optometry, Orthoptics & Optical services exist in the Institute / Hospital where the internship training has to be undertaken. Following parameters / guidelines have been suggested:
    - a) It is mandatory for the Institution to have its own well equipped and modern Department of Ophthalmology/Optometry and should be registered with state authorities.
    - b) Senior Optometrist under supervision of Senior Ophthalmologist should manage the Institutes/Hospitals.

Institute's Director / Principal can at his discretion grant NOC to the students to do the Internship at the place of his choice provided the concerned Hospital/Pathology Laboratory fully satisfies the above criteria. For the purpose of granting NOC the candidate shall have to submit to the Institution the status of Pathology Laboratory services available at the place where he intends to do his Internship.

**Degree:**

On successful completion of Four year programme the candidate will be awarded with **“Bachelor of Science in Optometry” (B.Sc. Optometry)** from Rama University. The candidate will now be eligible to be registered in the U.P. State Medical faculty. After the registration he/she shall be eligible to pursue his future career in Optometry.

## Examination Schedule : (University Examination)

### B.Sc. Optometry (First Year)

SR. NO.	Subject	Subject Code	Theory marks				Practical Marks				Total Marks
			Theory Paper	Internal Assessment	Min. Marks	Total	Practical	Internal Assessment	Min. Marks	Total	
1	Anatomy-I (General)	BO-101	80	20	50	100	80	20	50	100	200
2	Anatomy-II (Ocular)	BO-102	80	20	50	100	NA	NA	NA	NA	100
3	Physiology-I (General)	BO-103	80	20	50	100	80	20	50	100	200
4	Physiology-II (Ocular)	BO-104	80	20	50	100	NA	NA	NA	NA	100
5	Biochemistry	BO-105	60	40	50	100	—	—	—	—	100
6	Geometric & Physical Optics	BO-106	80	20	50	100	—	—	—	—	100
<b>GRAND TOTAL</b>											<b>800</b>
7*	Environmental Studies	---	100	NA	50	100	NA	NA	NA	NA	100
8*	Professional Communication in English	---	100	NA	50	100	NA	NA	NA	NA	100

\* These subjects are only to qualify in Internal Assessment. Not included for University Examinations.

### B.Sc. Optometry (Second Year)

SR. NO.	Subject	Subject Code	Theory marks				Practical Marks				Total Marks
			Theory Paper	Internal Assessment	Min. Marks	Total	Practical	Internal Assessment	Min. Marks	Total	
1	Ocular Disease (Anterior Segment)	BO-201	80	20	50	100	NA	NA	NA	NA	100
2	Visual Optics	BO-202	80	20	50	100	NA	NA	NA	NA	100
3	Clinical Refraction and Lighting of the Eye	BO-203	80	20	50	100	80	20	50	100	200
4	Ophthalmic & Optical Instrumentation and Dispensing Optics	BO-204	80	20	50	100	80	20	50	100	200
5	General Pathology & Microbiology	BO-205	80	20	50	100	80	20	50	100	200
6	General Pharmacology	BO-206	80	20	50	100	—	—	—	—	100
<b>GRAND TOTAL</b>											<b>900</b>
7*	Computer Fundamentals & Programming	---	100	NA	50	100	NA	NA	NA	NA	100

\* These subjects are only to qualify in Internal Assessment. Not included for University Examinations.

## B.Sc. Optometry (Third Year)

SR. NO.	Subject	Subject Code	Theory marks				Practical Marks				Total Marks
			Theory Paper	Internal Assessment	Min. Marks	Total	Practical	Internal Assessment	Min. Marks	Total	
1	Ocular Diseases (Posterior Segment) & Systematic Diseases of the eye	BO-301	80	20	50	100	NA	NA	NA	NA	100
2	Binocular Vision & Ocular Motility	BO-302	80	20	50	100	NA	NA	NA	NA	100
3	Contact Lens	BO-303	80	20	50	100	80	20	50	100	200
4	Low Vision Aid & Visual Rehabilitation	BO-304	80	20	50	100	80	20	50	100	200
5	Clinical Refraction & Applied Optometry & Orthoptics	BO-305	80	20	50	100	80	20	50	100	200
6	Public Health & Community Medicine and Biostatistics	BO-306	80	20	50	100	NA	NA	NA	NA	100
									<b>GRAND TOTAL</b>	<b>900</b>	



# Course Structure

## FIRST YEAR

### COURSE OF STUDY

#### B.Sc. in Optometry Part-I (First Year)

Sr. No.	Subjects	Teaching Hours		
		Theory	Practical	Total
1.	Anatomy-I (General)	70	20	90
2.	Anatomy-II (General)	70	20	90
3.	Physiology-I (General)	70	20	90
4.	Physiology-II (Ocular)	70	20	90
5.	Biochemistry	70	20	90
6.	Geometric & Physical Optics	70	20	90
		<b>420</b>	<b>120</b>	<b>540</b>
6.*	Environmental Studies (EVS)	20	—	20
7.*	Professional Communication in English	40	—	40

\* Not included for University Examinations.

#### B.Sc. in Optometry Part-II (Second Year)

Sr. No.	Subjects	Teaching Hours		
		Theory	Practical	Total
1.	Ocular Diseases (Anterior Segment)	70	30	100
2.	Visual Optics	70	30	100
3.	Clinical Refraction & Lightening and & Eye	70	30	100
4.	Ophthalmic & Optical Instrumentation and Dispensing Optics	70	30	100
5.	General Pathology & Microbiology	50	30	80
6.	General Pharmacology	50	30	80
7.*	Computer Fundamentals & Programming	30	30	60

\* Not included for University Examinations.

### B.Sc. in Optometry Part-III (Third Year)

Sr. No.	Subjects	Teaching Hours		
		Theory	Practical	Total
1.	Ocular Diseases (Posterior Segment) & Systematic Diseases of the eye	70	30	100
2.	Binocular Vision & Ocular Motility	70	30	100
3.	Contact Lens	70	30	100
4.	Low Vision Aids & Visual Rehabilitation	70	30	100
5.	Public Health & Community Medicine and Biostatistics	70	30	100
6.	Clinical Refraction & Applied Optometry & Orthoptics	70	30	100

**Note:** Subsidiary subjects (i) Computer Fundamentals & Programming  
(ii) Professional Communication in English  
(iii) EVS (Environmental Science & Ecology)

All the subsidiary subjects examination will be conducted by the faculty of Paramedical Sciences. Their marks will not be counted in the grand total of university examinations. But EVS subjects will be included in the mark sheet of the University Exams. Passing Subsidiary subjects is mandatory as per guidelines of UGC to complete the course.

# **DETAILED SYLLABUS**

## **B.Sc. Optometry (First Year)**

### **ANATOMY (General)**

**PAPER CODE: BO-101**

#### **COURSE PLAN:**

1. Introduction to Human Anatomy: Anatomy: Definition and its relevance in medicine and optometry Planes of the body, relationship of structures, organ system, Skeleton System, Tissues of the Body: Epithelium, connective tissue, bone and cartilage, Embryology, histology, different types of each of them, types of cells, cellular differentiation and arrangements in different tissues.
2. Muscles: Different types of muscles, their functional differentiation, their relationship with different structures, their neural supply
3. Blood Vessels: Differentiation between arteries and veins, embryology, histology of both arteries and veins, Functional differences between the two, anatomical differences at different locations
4. Skin and appendages: Embryology, anatomical differences in different areas, functional and protective variations, innervations, relationship with muscles and nerves
5. Lymphatic system: Embryology, functions, relationship with blood vessels and organs
6. Glands: Embryology, different types of glands (exocrine and endocrine), functional differences, neural control of glands
7. Nervous system: Parts of Nervous system, cell types of nervous system, Blood-brain barrier, Reflex arc, Peripheral Nerves, Spinal nerves, Nerve fibers, Autonomic Nervous system
8. Brain and Cranial nerves: Major parts of Brain, Protective coverings of the Brain, Cerebrospinal Fluid, Brain stem, Cerebellum, Diencephalon, Cerebrum, Cranial nerves

### **PRACTICAL**

Practical demonstration of each organ using specimen. If specimen for certain organs are not available, then videos can be shown to make the student understand the anatomic structures.

**ANATOMY-II (Ocular)**  
**PAPER CODE: BO-102**

**1. Embryology –ocular**

Formation of optic vesicle & optic stalk, formation of lens vesicle, formation of optic cup, changes in associated mesoderm, development of various structure of eye ball – retina, optic nerve, crystalline lens, cornea, sclera, choroid, ciliary body, iris, vitreous. Development of accessory structures of eyeball – eyelids, lacrimal apparatus, extra-ocular muscles, orbit. Milestones in the development of the eye.

**2. Orbit**

Bony orbit → Size, shape & relations, walls of the orbit, Base of the orbit, Apex of orbit. Orbital fascia → Fascial bulbi, Fascial sheaths of extraocular muscles, intermuscular septa. Spaces of orbit → Orbit fat & reticular tissue - Apertures at the base of orbit- Contents of the orbit - Orbital nerve → oculomotor, Trochlear, Abducent, Trigeminal, facial nerves - their functional components, course & distribution, clinically applied aspects.

**3. Cornea** → (a) Layers & peculiarities, (b) Blood supply & nerve supply of cornea. (c) Corneal Transparency.

**4. Lens, Zonules** → (a) Structure of lens → capsule, Ant. Epithelium, lens fibers (structured & zonal arrangement), (b) Ciliary zonules → structure gross appearance, (c) Arrangement of zonules fibers.

**5. Uveal Tract & its vascular supply** → (a). Iris macroscopic & microscopic appearance. (b) ciliary body – Macroscopic structure. (c) choroid - Macroscopic structure. (d) Blood supply to uveal structure- short & Long Posterior artery & Anterior Artery. (e) Venous drainage.

**6.**

**7. Vitreous-** main masses of vitreous. Base of the vitreous. Hyaloidean vitreous. Vitreous cells.

**8. Sclera** – Anterior, posterior & middle apertures. Episclera. Sclera proper. Lamina fusca. Blood supply of the sclera. Nerve supply of the sclera.

**9. Anterior chamber and its angle-** angle of the anterior chamber. Trabecular meshwork. Canal of Schlemm. Schwalbe's line. Drainage of aqueous humor.

**10. Retina & its vascular supply** → (a) Gross anatomy, (b) Microscopic structure of fovea centralize, (c) Blood retinal barrier (d) Anatomy of optic nerve, (e) Anatomy of optic nerve, (f) optic chiasma optic tracts, (g) Lateral Geniculate body, (h) optic radiation (i) visual cortex, (j) Arrangement of nerve fibers (k) Blood supply of visual pathways (Arterial

circle of willis & its branches).

**11. The Ocular motor system** → Extraocular muscles, nerve supply, motor nuclei, supra nuclear motor centers.

**12. The pupillary & ciliary muscle** → Anatomy of sphincter & Dilator muscle. Ciliary muscle – Anatomy, types

**13. The nerve supply** of the eye ball.

**14. The lachrymal apparatus** → (a) Lachrymal gland, (b) Palpebral part, (c) Duets of lachrymal gland, (d) structure of the lachrymal gland, (e) Blood supply & nerve supply of the lachrymal gland, (f) lachrymal passages.

**15. Anatomy of the Ocular Adnexa & glands;** Lids -a. Structures of the lids: - Skin, Subcutaneous Areolar Layer, Layer of Striated muscle, Submuscular Areolar Tissue, Fibrous Layer, Conjunctiva. Glands of the Lids- Meibomian Glands, Glands of Zeis and Glands of Moll. Blood Supply of the Lids, Lymphatic Drainage of the Lids, Nerve Supply of the Lids.

Conjunctiva - Palpebral Conjunctiva, Bulbar Conjunctiva, Conjunctival Fornix, Microscopic Structure of the conjunctiva- Epithelium, Substantia Propria. Conjunctival Glands Krause's Glands, Wolfring's Glands, Henley's Glands, Manz Glands. Blood Supply of the Conjunctiva, Nerve Supply of the Conjunctiva, Caruncle, Plica Semilunaris.

# **PHYSIOLOGY-I (General)**

**PAPER CODE: BO-103**

## **GENERAL PHYSIOLOGY**

### **COURSE PLAN:**

1. **CELL STRUCTURE & ORGANIZATION** Tissue organization Epithelium  
Connective tissue –Collagen fibers –Elastic fibers –Areolar fibers Cartilage –Bone  
Contractile tissue –striated –skeletal –cardiac –non striated –plain –myoepithelial  
General principles of cell physiology Physiology of skeletal muscle
2. **BLOOD:** Composition Volume measurement & variations Plasma proteins –  
classification & functions Red blood cells –development, morphology & measurements  
–functions & dysfunctions. White blood cells –development –classification,  
morphology –functions & dysfunctions Platelets –morphology –development,  
functions & dysfunctions Clotting –factors –mechanism –anti- coagulants dysfunctions  
Blood grouping –classification –importance in transfusion, Rh factor & incompatibility  
Suspension stability Osmotic stability Reticulo endothelial system
  - o Spleen
  - o lymphatic tissue
  - o Thymus
  - o bone marrow
  - o immune system
  - o cellular
  - o Humoral
  - o Autoimmune
3. **DIGESTION:** General arrangement Salivary digestion –functions & regulations  
Gastric digestion –functions & regulations Pancreatic digestion –functions &  
regulations Intestinal digestion –functions & regulations Liver & bile Absorption  
Motility Deglutition Vomiting Defecation Functions of large intestine Neurohumoral  
regulations of alimentary functions, summary
4. **EXCRETION:** Body fluids –distribution, measurement & exchange, Kidney –structure  
of nephron –mechanism of urine formation –composition of the urine and abnormal  
constituents –urinary bladder & micturition
5. **ENDOCRINES:** Hormone mechanism –negative feed backs –tropic action –  
permissive action – cellular action, hypothalamic regulation Thyroid –  
hormones, actions, regulations Adrenal cortex - hormones, actions, regulations  
Adrenal medulla –hormones, actions, regulations Parathyroid – hormones,  
actions, regulations Islets of pancreas –hormones, actions, regulations Miscellaneous  
\_ hormones, actions, regulations Common clinical disorders
6. **REPRODUCTION:** Male reproductive system –control & regulation Female  
reproductive system –uterus –ovaries –menstrual cycle –regulation – pregnancy &  
delivery –breast –family planning

7. RESPIRATION: Mechanics of respiration –pulmonary function tests –transport of respiratory gases- neural and chemical regulation of respiration –hypoxia, cyanosis, dyspnoea– asphyxia.
8. CIRCULATION: General principles Heart: myocardium –innervation –transmission of cardiac impulse- Events during cardiac cycle –cardiac output. Peripheral circulation: peripheral resistances –arterial blood pressure –measurements –factors regulation variations –capillary circulation – venous circulation. Special circulation: coronary cerebral –miscellaneous
9. ENVIRONMENTAL PHYSIOLOGY Body temperature regulation (including skin Physiology). Exposure to low and high atmospheric pressure
10. NERVOUS SYSTEM: Neuron –Conduction of impulse –synapse –receptor. Sensory organization –pathways and perception Reflexes –cerebral cortex –functions. Thalamus –Basal ganglia Cerebellum. Hypothalamus. Autonomic nervous system – motor control of movements, posture and equilibrium – conditioned reflex, eye hand co-ordination,
11. SPECIAL SENSES –(Elementary) Olfaction –Taste –Hearing

### PRACTICAL

1. Blood test: Microscope, Haemocytometer, Blood, RBC count, Hb, WBC count, Differential Count, Haematocrit demonstration, ESR, Blood group & Rh. type, Bleeding time and clotting time
2. Digestion: Test salivary digestions
3. Excretion: Examination of Urine, Specific gravity, Albumin, Sugar, Microscopic examination for cells and cysts
4. Endocrinology and Reproduction: Dry experiments in the form of cases showing different endocrine disorders.
5. Respiratory System: Clinical examination of respiratory system, Spirometry, Breath holding test
6. Cardio Vascular System: Clinical examination of circulatory system, Measurement of blood pressure and pulse rate, Effect of exercise on blood pressure and pulse rate
7. Central Nervous System: Sensory system, Motor system, Cranial system, Superficial and deep reflexes

## **PHYSIOLOGY-II (Ocular)**

**PAPER CODE: BO-104**

### **1. Cornea:**

Brief idea about ultra & histological structure of cornea. Corneal transparency & hydration, Regulation of corneal transparency & hydration. Corneal vascularization. Maurice theory & Goldman's theory

### **2. Uveal tissue:**

Brief idea about uvea. Uveal meshwork. Uveo-scleral drainage. Schlemm's canal switch.

### **3. Lens:**

Basic idea about human lens. Function of lens. Lens transparency. Lens culture. Changes in ageing lens. Cataract – overview.

### **4. Aqueous humour:**

Formation of Aqueous humour. Drainage & circulation of Aqueous Humor. Rates of production & flow. Functions of Aqueous humour.

### **5. Vitreous Humour:**

Composition & distribution of vitreous humour, Physiology & function of vitreous humour, Optical role of vitreous humour.

### **6. Retina:**

Retinal structure-layers of retina. Brief idea about rod & cones. Organization of retina. Function of retina.

### **7. Optic Nerve:**

Physiology of optic nerve. Papilledema of optic nerve. Optic atrophy.

### **8. Ocular Circulation :**

Vascular structure of the eye – ocular circulation, blood-ocular barrier (Blood-retinal, blood Vitreous & blood aqueous barrier). Regulation of ocular circulation.

### **9. Protective Mechanism of the eye –**

- a) Blinking – muscles of lid closer & lid opening (orbicularis oculi, levator palpebre, Muller's muscle, blinking reflexes.
- b) Lacrimation –
  - i. Lacrimal glands
  - ii. Pre corneal tear film
  - iii. Chemistry of lachrymal secretion tear film
  - iv. Tear film dynamics ( secretion of tear, formation of tear, retention & redistribution of tear, displacement phenomena, evaporation from tear film, drying & breakup of tear film, dynamic events during blinking, elimination of tear.)



## **10. The ocular motor system:**

- a) Extra ocular muscles their function & nerve supply
- b) Mechanics of actions of extra ocular muscles -cross sectional area of muscle, length of muscle. Arc of contact, muscle plane, Muscle axis of rotation.
- c) Physiology of ocular movement – Basic Kinematics, ( position of gaze, Fick’s axes)
- d) Ocular Movement (monocular and Binocular). Supra nuclear control of eye movements.
- e) Ocular movements -
  - i. Monocular Movements ( Adduction, Abduction, supraduction, Infraduction, Incycloduction, excycloduction)
  - ii. Binocular Movements –VERSIONS- (saccadic & pursuit movement, position maintenance movements, stabilization movements & their characteristics). VERGENCES – (Convergence, divergence, vertical vengence),

## **11 . Intraocular pressure:**

Features of normal IOP, Factors influencing the IOP, Control of IOP, Measurement of I OP.

## **12. Pupil –**

Normal pupil, Physiological changes in pupil size – Isocoria, Pupillary unrest, Hippies. Pupillary reflex – Light reflex, Near reflex, Darkness reflex , Psycho sensory reflex, Lid closure reflex

## **13. Accommodation –**

- a) Far point , near point, range & amplitude of Accommodation
- b) Mechanism of accommodation – Increased tension theory, Relaxation theory, Role of lens capsule, Gullstrand mechanical model of accommodation,
- c) Stimulus for accommodation
- d) Ocular changes in accommodation.
- e) Changes in accommodation with arc ( Presbyopia)
- f) Nervous mechanism for accommodation

## **14. Color vision-**

- a) Physiological, Photochemical & neurological basis of color vision
- b) Electrophysiology of color vision
- c) Granit’s modulator and dominator theory, Purkinje phenomenon. Young-Helmholtz theory
- d) Types of color defects
- e) Color blindness
- f) Neural analysis

**15. Geniculate cortex:**

- a) Structure of geniculate cortex.
- b) Electrophysiology
- c) Projection – retinal projection
- d) Detail idea about visual cortex & function of visual cortex.

**16. Visual perception –**

- a) Higher integrative activity, Binocular perception, stereoscopic depth perception.
- b) Neurophysiology of perception – Higher visual pathways(primary visual Pathway to cerebral center, Lateral Geniculate body, non-geniculate targets for retinofugal input, visual center)
- c) Neurophysiology of perception – Spatial analysis, Double pathway to higher visual centers.

**17. Physiology of vision –**

- a) Visual acuity – visual angle, Components of Visual acuity ( Minimum visible, Resolution , Recognition Hyperacidity ), Factors affecting, Measurement of visual acuity.
- b) Contrast Sensitivity – Types- (spatial & Temporal contrast sensitivity), Neural Mechanism, Measurement of contrast sensitivity ( Arden gratings , Cambridge low contest gratings, Pelli – Robson chart)
- c) Light & Dark adaptation – Dark adaptation curve, Mechanism of dark adaptation, Factors influencing dark adaptation, Time course of light adaptation, Mechanism of light adaptation, Rod vs. cone light adaptation. Parkinje shift of spectral sensitivity.
- d) Binocular vision – Grades of binocular vision (simultaneous, fusion & stereopsis ), Advantages of binocular vision, visual direction & horopter, Binocular fusion, Dichoptic stimulation , Depth perception, Integration of motor & sensory system.
- e) Electrodiagnostic tests – ERG, EOG, VER

# **BIOCHEMISTRY**

**PAPER CODE: BO-105**

**1. Basic concept & metabolism of carbohydrate, protein & fat.** Process of glycolysis, glycogenolysis, TCA cycle- significance. Non Protein Nitrogen, Nitrogen balance, Metabolism of Amino acids, Transamination, Deamination. Process of Beta-oxidation of unsaturated fatty acid, Alpha & Gamma oxidation overview.

**2. Amino acids, protein structure-**

- a. Amino acids- Function, classification, properties
- b. Protein - Primary, secondary, tertiary & quaternary structures & the bond involves.

**3. Brief outline: Enzyme-**

General characteristics, classification, Factors affecting enzymatic activity. Kinetics of Enzyme –  $K_m$ . Michaelis Menten equation. Line Weaver Burk plot. Enzyme Inhibition – Reversible & Irreversible. Allosteric enzyme.

**4. Oxygen transporting protein**

Hemoglobin & Myoglobin – Structure & their characteristics. Comparison between hemoglobin & myoglobin. Oxygen transporting Mechanism of Hemoglobin affinity for Oxygen. Bohr's effect

**5. Vitamins**

Water & Fat soluble Vitamins. Vitamins- A,D,E,KP,C B complex- source, daily requirement, Metabolism, Functions, deficiency.

**6. Basic outline of hormone action**

Physical & Chemical Characteristics of hormone. Types of hormone. General mechanism of hormone action via Messenger system. Source & importance of different hormones-STH, ACTH, GTH, T4, parath hormone, Insulin, Glucagon, Glucocorticoid, Mineralocorticoid, Melatonin, Estrogen, Progesteron, Testosterone & HCG

**7. Cornea** – Biochemical composition of cornea. Sources of Nutrients-Oxygen, Glucose, Amino acid. Metabolic pathway in cornea – Glycolysis, HMP shunt.

**8. Tear film-**

Functions of Tear film. Different layers of Tear film. Chemical composition of tears. Tear film abnormalities. Tests for film Adequacy.

**9. Lens** – Biochemical composition of lens. Lens protein – their types & characteristics. Lens Metabolism - Carbohydrate metabolism, protein metabolism. Cataract – Due to biochemical defects of lens. Antioxidant mechanism in the lens.

**10. Biochemistry of the visual process-**

Photopigments – Rhodopsin & Iodopsin. Chemical nature of Rhodopsin. Visual cycle (Bleaching of Rhodopsin, Transducin cycle, Role of Phosphodiesterases).

# **GEOMETRIC & PHYSICAL OPTICS**

**PAPER CODE: BO-106**

## **GEOMETRICAL OPTICS**

- What is light- dual nature- particle & wave nature, speed, wave length & frequency of light.
- Fermats' principle- laws of relation & refraction at a plane surface using Fermats' principle.
- Snells' law, relative and absolute refractive indices, total internal reflection and Critical angle, refraction by plane parallel slab of glass; molecular basis of reflectivity (basic index).
- Geometrical path length & optical path length of rays, Concept of wave fronts & rays, concept of vergence- divergence, convergence.
- Refraction by spherical surfaces- convex & concave, Derivation of vergence equation, focal points, deposite power, image point, lateral & axial magnification, simple numerical.
- Thin Lens- shapes, derivation of lens makers' formula, thin lens vergence equation, equivalent focal length of two thin lenses separated by a distance & placed in contact, lateral magnification of thin lenses in contact, simple numerical, concept of reduced systems.
- Thick Lens- Cardinal points & planes, front & back vertex power, matrix theory in paraxial Optics to locate positions of cardinal planes. Different types of aberrations & their effects.
- Prism- Dispersion of prism, reflecting prisms , prisms diopters.
- Geometrical theory of optical fibers. Uses of optical fibers.

## **PHYSICAL OPTICS (OPTICS-II)**

- Dual nature of light- Simple harmonic motion- differential; Simple harmonic waves- mathematical representation; Super position of simple harmonic waves.
- HUYGENS' principle – laws of reflection and refraction at plane and spherical surfaces. Wave velocity & group velocity; determination of velocity of light (any one method.)
- Interference: Coherence; path and phase difference; Theory of interference fringes- intensity distribution in fringes; Young's double slit experiment- Fresnel's biprism, Lloyd's error experiments; visibility of fringes.
- Interference in thin films due to reflected and transmuted light- Interference in wedge shaped films; Newton's ring experiment ; Color of thin films; Thin film antireflection coating and filters.

- Diffraction:
- Diffraction by single slit; double slit, multiple slit- grating, circular aperture – amplitude & intensity distribution (final expressions only)
- Circular aperture- airy pattern, resolution by circular apertures.
- Diffraction grating- reflection, transmission , amplitude & phase gratings(definitions in brief) Grating dispersion & dispersive power, spectral resolution; zone plates.

#### Polarization & Crystal Optics:

- Concept of polarization , linear , circular , elliptical polarization (qualitatively), Plane of polarization & vibration, degree of polarization, polarizers, analyzers, Production of polarized light, birefringence, calculate crystal , veal prism, Wallaston prism , retarders - full, half & quarter wave plates, analysis of light of unknown Polarization.
- Linear Scattering- Raleigh & Mee
- Principles of LASERS
- Holography – basic principle; simple experimental arrangement, some applications.

## **EVS (ENVIRONMENTAL SCIENCE & ECOLOGY)**

**(Not included in University Examination)**

### **General**

Introduction, components of the environment, environment degradation.

### **Ecology**

Elements of Ecology; Ecological balance and consequences of change, principles of environmental impact assessment.

### **Air Pollution and Control**

Atmospheric composition, energy balance, climate, weather, dispersion, sources and effects of pollutants, primary and secondary pollutants, green house effect, depletion of ozone layer, standards and control measures.

### **Water Pollution and Control**

Hydrosphere, natural water, pollutants: their origin and effects, river/lake/ground water pollution, standards and control.

### **Land Pollution**

Lithosphere, pollution (municipal, industrial, commercial, agricultural, hazardous solid wastes); their origin and effects, collection and disposal of solid waste, recovery and conversion methods.

### **Noise Pollution**

Sources, effects, standards and control.

## **PROFESSIONAL COMMUNICATION IN ENGLISH**

**(Not included in University Examination)**

- Grammar-structure of sentences etc.
- Essay- Descriptive-Comparative-Argumentative etc.
- Reading Comprehension from recommended text etc. biodata, Resume-curriculum vitae etc.
- Report writing-structure, types of reports etc.
- Communication-public speaking skills, features of effective speech etc.
- Group discussions-principle-practice etc.

Reference books: a. Communication (Mark McCormack)  
b. How to write reports (John Metchell)  
c. Business Correspondence and Report R.C. Sharma & K.Mohan)  
(Tata Mc Graw , New Delhi 1984)

## SYLLABUS

### **B.Sc. Optometry (Second Year)**

#### **OCULAR DISEASE (Anterior Segment)**

##### **PAPER CODE: BO- 201**

- Anterior segment ocular diseases involving orbit, eyelids, adnexa, conjunctiva, cornea, urea, sclera, anterior chamber, iris and lens. Symptomatology, clinical signs, diagnosis, pathogenesis, pathophysiology , systemic disease relationships and treatment of degenerative, infections and inflammatory conditions affecting these structures.
- Disease of the Lids – Congenital Deformities of the Lids. Oedema of the Lids. Inflammatory Conditions of the Lids. Deformities of the Lid Margins. Deranged Movement of the Eyelids. Neoplasm's of the Lids. Injuries of the Lids.
- Diseases of the Lachrymal Apparatus-. Dry Eye. Disease of the Lachrymal Gland. Disease of the Lachrymal Passages. Operations for Chronic Dacryocystitis.
- Disease of the Conjunctiva- Subconjunctival Haemorrhage Infective Conjunctivitis. Follicular Conjunctivitis. Granulomatous Conjunctivitis. Allergic Conjunctivitis. Conjunctivitis Associated with Skin conditions. Degenerative conditions of the Conjunctiva. Vitamin- A Deficiency. Cysts and Tumours of the Conjunctiva. Conjunctival Pigmentation . Injuries of the Conjunctiva.
- Disease of the Cornea –Congenital Anomalies. Inflammation of the Cornea (Keratitis). Superficial Keratitis. Deep Keratitis. Vascularisation of Cornea. Opacities of the Cornea. Keratoplasty. Corneal Degenerations. Corneal Dystrophy's. Corneal Pigmentation. Corneal Injuries. Refractive Corneal Surgery. Corneal Ulcer ( Bacterial , Viral , Fungal )
- Disease of the Sclera- Episcleritis. Scleritis. Staphyloma of the Sclera. Blue Sclerotic Scleromalacia Performs. Nanophthalmos. Injuries of the Sclera.
- Disease of the Iris.-. Congenital Anomalies. Inflammations (Anterior Uveitis) . Specific Types of Iridocyclitis . Degenerations of the Iris. Cysts and Tumours of the Iris. Injuries of the Iris.
- Disease of the Celery Body- Inflammations of the Celery Body. Purulent Iridocyclitis (Panophthalmitis) . Evisceration . Sympathetic Ophthalmia. Vogt- Koyanagi – Harada Syndrome. Tumours of the Celery body. Injuries of the Celery body.
- Glaucoma- .Formation of Aqueous Humor. Drainage of Aqueous. Intraocular Pressure(IOP) . Ocular Rigidity.

Tonography. .Developmental Glaucoma (Buphthalmos) . Primary Narrow Angle Glaucoma. Primary Open Angle Glaucoma. Normotensive Glaucoma . Ocular Hypertension . Secondary Glaucoma.

Surgical Procedures for Glaucoma(Steps Only) ,YOGPI ,trabeculectomy.Laser Procedure in Glaucoma . Artificial Drainage Devices in Glaucoma Surgery(Molteno).

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



## VISUAL OPTICS

PAPER CODE: BO-202

- Review of Geometrical Optics: From Geometrical Optics.
- Schematic and reduced eyes and their properties.
- Optical constants of the eye and their measurement. Purkinje images. Corneal curvature and thickness. Keratometry and pachometry. Indices of aqueous and vitreous.
- Optical Defects of the Eye- Shape of Cornea, Shape & RI of the lens, Optical axis, Visual axis (angle alpha, Fixation axis (angle gamma), Aberration of the Optical system of eye, Depth of focus, Diffraction & resolving power.
- Emmetropia and ametropia, Axial versus spherical ametropia, Myopia Hypermetropia (Hyperopia) Astigmatism.
- Accommodation- possible mechanism of accommodation- Schiener disc experiment- theories of accommodation- modern theory- changes in the lens during accommodation- the amplitude of accommodation- the measurement of the amplitude n of accommodation- depth of field, luminance and blur tolerance- amplitude of accommodation versus age.
- Presbiopia-near vision addition- estimate of addition-unequal near vision addition- effect of changing the spectacle distance – hypermetropia and accommodation.
- Correction of ametropia
- Correction of myopia- spectacle refraction (F) – ocular refraction(K) – Relationship between F and K. correction of hypermetropia- the effect of vertex distance change. Correction of ametropia with Thick lenses. Some problems involving K.
- Clear and blurred images in the reduced and simplified schematic eyes. The visual axis. Pupil size and blur disc diameter. Depth of field . retinal image size in uncorrected reduced eye. Spectacle magnification in reduced and corrected eyes. Nodal points and clear image size. Retinal images with a near object. Spectacle magnification in near vision. The simple magnifier. Relative spectacle magnification. Correction of spherical ametropia with contact lens. Spectacle magnification with a contact lens.
- Ammetropia in the actual human eye. The growth of the human eye in emmetropia. Spherical ametropia in adult eye. Genetic aspects of refractive error. Summary of the causative factors involved in ametropia . Progressive myopia. Juvenile stress myopia.
- Aphakia. Reflective error in aphakia. The retinal image size in aphakia. Correction of aphakia by a contact lens. Use of an intracocular implant. Power of the implant and retinal image size. Clinical aspects of aphakia.
- Astigmatism. □ Oblique astigmatism. Astigmatism in the reduced eye. Th retinal images of point and extended objects. Classification of astigmatism. Correction of astigmatism by sphero- cylindrical, toric and contact lenses.
- Retinoscopy – principle and use. Clinical recording of standard of vision-visual acuity.
- Review of subjective refractive methods. Problem of review of objective refractive methods Cross- cylindrical method of detecting astigmatism
- Eye as an imaging instrument. Schematic eyes. Diffraction and the eye. Image formation in wave optics. Aberrations of the lens and cornea. Chromatic aberration of the eye. Optical performance of the eye. Total performance of the eye. Variation of visual performance with focus. Contrast sensivity of the eye.

# CLINICAL REFRACTION & LIGHTENING OF THE EYE

PAPER CODE: BO-203

## CLINICAL REFRACTION

1. Ophthalmic Case Historian: Demographic data, chief complaints, secondary complaints, ocular history, medical history, drugs and medications, family ocular history, family medical history, social history, review of system, few example of history writing.
2. Recording Visual Acuity: Distance – Snellens and log MAR. near-points/'M'/RS, use of Baily-lovie word reading chart.
3. Objective Refraction: Streak Retinoscopy – all procedures to use streak retinoscope; static and dynamic retinoscopy, different methods of dynamic retinoscopy – MEM, Nott's, Sheard's, Low and high neutral, Bells, Cross, Taits. Other methods of retinoscopy-Radical, Near(Mahandra), Chromoretinoscopy, String Lensbar, use of objective and autorefractor.
4. Subjective Refraction: Monocular Distance – Classic fogging, testing of astigmatism under fog fixed astigmatic dial (clock dial), rotary astigmatic dial, combination of fixed and rotary dial (Fan and Block test), J.C.C. Duochrome or Bichrome, Binocular balancing – alternate occlusion, prism dissociation, dissociated duochrome balance, Borish dissociated fogging, equalization
5. Binocular Distance – T.I.B. (Turville Infinity Balance), Polarized – Target and polarized filter, fogging.

Near subjective refraction.

Cycloplegic refraction, cycloidemia, sudden unfogging , Borish delayed spherical end point, pinhole estimation of refractive error, stenopaic slit refraction, measurement of vertex distance, distometer, use of subjective autorefractor.

Different methods of measuring amplitude of accommodation.

Correction of Presbyopia – Different methods of stimulation of tentative presbyopic addition – amplitude of accommodation, J.C.C., NRA-PRA balance, Bichrome, Plus Build-up, based on age, Dynamic retinoscopy. Occupational consideration, finalization of odd for near and intermediate- different options of correction.

Measurement of IPD and significance. Final discussion with the patient.

Writing prescription of power and counseling

## **Clinical Refraction (Practical)**

- History writing
- Recording VA
- Practice of Streak Retinoscopy
- Direct Ophthalmoscopy-Normal Fundus
- Subjective refraction – fogging, clockdial, fan, JCC, prism balance, TIB, duochrome, cyclodeimia, Slit refraction
- Measurement of amplitude of accommodation.
- Presbyopic add
- Writing prescription.

## **LIGHTING OF THE EYE**

- Eye and Vision: Spectroradiometric curve-  $V_{\lambda}$  - curve- photopic and scotopic vision CIE standard observes.
- Photometric quantities and units- Luminous Flux, Lumen- Illuminance, lux Luminous intensity, Candela – Luminance, Candela/m<sup>2</sup>. Inverse square law and Cosine law of illumination (Illuminance)
- Photometry- Lumer Brodhum photometer, Guild Flicker photometer- Photocells photo multipliers – photodiodes-noise in physical photometers. Determination lighting of Polar curve of lamps.
- Calculation- Application of inverse square law and Cosine law- Matt surfaces- Lumen method of lighting design – utilization factor, light loss factor, Glare and glare index- disability glare- discomfort glare- control of glare- contrast
- Light sources- Special energy distribution- luminous efficacy- color rendering properties- Flicker contracts- Daylight, its properties- color lamp – Incandescent lamps - low pressure Hg-lamps- High pressure Hg- lamps- Low-pressure NA- lamp- High pressure NA-lamps- Typical applications.
- Lighting Installation- Luminaries their design function up lighting – down lighting mounting position-Choice of lighting equipment- lighting system management.
- Recommended level of illuminance for various including those in optometry and ophthalmology driving etc.
- VDU- Design of work station – Flicker color contrast- Regulations regarding the use of VDU.
- Eye Protectors- their constructions standard relating to eye protection

Books:

Illumination Engineering, J. B. Murdoch.

**OPHTHALMIC & OPTICAL INSTRUMENTATION &**  
**DISPENSING OPTICS-I**

**PAPER CODE: BO-204**

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

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

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

## PRACTICAL SYLLABUS

### OPHTHALMIC & OPTICAL INSTRUMENTATION & DISPENSING OPTICS

To study the operations of the following instruments:-

1. Focimeter or Lensometer.
2. Retinoscope.
3. Standard Test Charts.
4. Autorefractometer.
5. Slit Lamp Examination.
6. Keratometer.
7. Ophthalmoscope.

Clinical use of the following instruments & the findings:

- Tonometer
- Devices for color vision testing
- Auto Perimeter-Normal HFA, printout
- A-scan:- Normal Print Out & analysis
- B-scan:- Normal Print Out & analysis

### **OPHTHALMIC INSTRUMENTS & DISPENSING OPTICS**

#### **Ophthalmic lens :**

##### **1. Characteristics of lenses:**

Introduction. Spherical lenses. Plano-cylindrical lenses. Sphero-cylindrical lenses. Designation of lens power. Power of lenses. Transposition. Write the prescription. Base curve of spherical lens. Base curve of cylindrical single vision lens. Aberration of lens. Prism prescription. Prism effects in a lens. Neutralization.

##### **2. Spectacle lenses:**

Characteristics of lens materials. Specific gravity ( weight ). Refractive index. Abbe number. Impact resistance. Scratch resistance. Curve variation factor.

##### **3. Current materials:**

Crown glass. CR-39. High -index glass. High -index plastic. Poly carbonate. Photochromatic materials.

##### **4. Lens types:**

Single vision lens. Bi-focal lenses. Tri-focal lenses. Vocational & occupational multifocal progressive lenses.

**5. Introduction of bi-focal lenses:**

History of bi-focal lenses. Modern bi-focal designs. Types of bi-focal designs. Glass tri-focal lenses. Invisible multi-focal Double segment lens. Plastic bi-focals.

**6. Ophthalmic lens coating:**

Anti-reflecting coatings. Special notes concerning anti-reflecting coatings. Protective coating, color coating.

**7. Absorptive lenses:**

Classification of lens tints. Chemical that produces color & assist in absorptive characteristics of glass lenses. Effect in prescription on lens color. Availability of tinted lenses.

**8. Impact resistant lenses:**

Types of impact resistant lenses. Plastic lenses. Impact resistant Dress-Eye wear lenses. Tempered glass lenses. Types of impact resistant lenses most beneficial of specific patients.

**9. Lens for special uses:**

Fresnel lenses. Thinlite lenses. Lenses for the Aphakic patient. Aspheric lenses.

10. Lens surfacing & quality. Principles of lens surface generation. Glass assessment. Faults in lens materials & lens surface. Inspection of lens quality.

Basics of dispensing:

1. Spectacle frame Current frame materials:

- a) Plastics
- b) Metals Frame types:
  - a) Combination of frames
  - b) Half-eye frames
- c) Mounts
- d) Nylon-cord frame
- e) Special purpose frames.

2. Frame measurements:

- a) The boxing system
- b) The datum system
- c) Comparison of the two systems
- d) Lens position
- e) Segment specification

3. Frame Selection:

- a) Fashion
- b) Function
- c) Feel
- d) Conflicting needs
- e) Price
- f) Standard alignment

4. Lens Selection:

- a) Ground rule for selection
- b) Selection criteria

5. Facial Measurement:

- a) The PD
- b) Visual axes
- c) Measuring inter papillary distance
- d) Using PD ruler
- e) Common difficulties in measuring PDs
- f) Measuring monocular PD
- g) Measuring near PD

6. Measuring heights:

- a) Single vision
- b) Multi focal
- c) Bi-focal
- d) Progressive

7. Pediatric Dispensing:

- a) The changing image of spectacle
- b) Age differences.

Frame Selection

- a) Technical Criteria
- b) Fashion criteria
- c) Some tips on selection Lens Selection

Technical criteria

- a) Communicating with kids.
- b) The kids corner

Facial measurement of the kids

- a) PDs
- b) Centers
- c) Bi-focals

8. Dealing with problems:

- a) Dealing with clients
- b) Common client problems
- c) Dealing with professional colleagues
- d) Dealing with the laboratories

9. Special needs dispensing:

- a) Occupational dispensing
- b) Hazards in the work place
- c) Occupational health safety legislation
- d) Common hazards.

10. Eye protection:

- a) Industrial eye protection
- b) Sport
- c) Standards covering eye protection
- d) Lens materials & impact resistance
- e) Frame & eye protection.

# GENERAL PATHOLOGY & MICROBIOLOGY

PAPER CODE: BO-205

## **Microbiology**

Bacteria: Cell structure, elementary idea about classification and morphological basis. Staining reactions: Gram staining, spore staining, acid fast staining. Bacterial growth: nutritional requirements, physical factor affecting, culture media, and growth curve. Elementary idea about bactericidal agents: Phenol, alcohol. Sterilization (principles, types & methods). Pasteurization. Antibiotics: Bacteriostatic and bactericidal effects.

Virus: elementary knowledge of viral-morphology, viral genome and classification, viral replication. Herpes viruses, hepatitis viruses, miscellaneous viruses, human immunodeficiency viruses.

Microbial growth & death, Laboratory culture, host pathogen interactions, antimicrobial chemotherapy, pathogenic mechanisms common to external ocular infections process – clinical pathology.

Physiology, pathology, treatment & epidemiology of infectious diseases caused by bacteria, virus, fungi & parasitic organisms with emphasis to disease with ocular manifestations & infectious eye diseases in hot climate as in India. AIDS & eye.

## **General Pathology**

Structure & function of immune system – Structure and function of thymus, spleen & red bone marrow- Immunity & its types, plasma proteins & immune reaction, cells involved in immune system. Humoral immunity theories of antibodies formation. Structure & function of lymph nodes. Structure & function of thymus, spleen & red bone marrow. Non specific immunity, Antibody mediated immunity, specific immunity, cell mediated immunity, Active immunity, Passive immunity.

The acute inflammatory reaction – changes in acute inflammation, changes in the calibre of the blood vessels, changes in blood flow, changes associated with exudation. Local sequelae of acute inflammation. The chemical mediators of acute

### **Inflammation & Repair:**

inflammation. Role of the mast cell in inflammation. Role of the platelets in inflammation. Chronic inflammation

– cause, classification, general features.

Source of infection. Transmission of organisms to the body. wound infections. Wound healing.

Immuno-pathogenesis – type I, II, III & IV hypersensitivity. Mechanism of autoimmunity. Organ specific & non organ specific auto immune disease. The HLA system – histocompatibility complex. Pyogenic & bacterial infection. Graft rejection-basic outline.

Disorder of growth – metaplasia, dysplasia, neoplasia. Circulatory disturbances – thrombosis, infarction, ischemia, embolism. Degeneration (calcification).



# **GENERAL PHARMACOLOGY**

**PAPER CODE: BO-206**

## **General Pharmacology:**

- Nature & Sources of drug. Routes of drug administration (general & Ocular). New drug delivery systems. Absorption & Bio availability of a drug. Distribution of a drug. Fate of a drug. Drug excretion & toxicity. Pharmacokinetics of drugs.
- Drug action □ site of drug action, structure activity relationship. Drug receptor. Mechanism of action of a drug. Dose response relationship. Adverse drugs reactions (ADR) in man, Manifestations of ADR. Treatment of Acute drug poisoning. Factors influencing drug metabolism & drug action. Classification of drugs.
- Drug action on the nervous system □ General Considerations. Aliphatic Alcohol's. General Anesthetics. Sedatives, Hypnotics and Pharmacotherapy of Insomnia. Drugs Effective in Convulsive Disorders. Opioid Analgesics. Analgesic – Antipyretics and Nonsteroidal Anti- inflammatory Drugs(NSAID). Central Nervous System Stimulants. Local Anesthetics □ Cocaine, Procaine and Other Synthetics Local Anesthetics. Autonomic Nervous System □ General Considerations. Adrenergic and Adrenergic Blocking Drugs.

## **Ocular**

- Preparation and packaging of ophthalmic drugs
- Drug action and effectiveness
- Ocular penetration
- Ophthalmic diagnostic drugs.
- Topical anesthetics
- Ophthalmic Drugs – antibiotics, corticosteroids, anesthetics, viscoelastics agents. Antiglaucomic drugs.

# **COMPUTER FUNDAMENTALS AND PROGRAMMING**

(Not included in University Examination)

## **Basic computer Architecture:**

Fundamentals of Computers, Block diagram of PC, peripheral devices of PC and their functions

## **Number System & Data Representation:**

Decimal Number System, Binary number system, Decimal to Binary conversion, Binary operations. Octal number system & the conversion. Octal to Decimal. Binary to Octal & Vice Versa.

## **Boolean Algebra:**

Definition, Difference between Boolean with Arithmetic & ordinary algebra. Two valued Boolean Algebra. Basic theorems of Boolean Algebra. Precedence of voperators. Boolean function & truth tables. The AND, OR, NOT gate. DeMorgans theorem. The NOR, NAND gate. The XOR & X-NOR gate. Conversion of Boolean expression into logic diagram. Using AND, OR, AND, NOT gates.

## **Logic Circuits:**

Combinational logic circuit, Adder , Subtractor, Decoder, Encoder.

## **Operating System:**

Introduction & classification of software, working principle of MS DOS ( Some basic internal & external commands). Creating a file. Windows & its components. Accessories, program manager, main, desktop icons.

## **MS- Office:**

Introduction of word processing-invoking MS-word – create, edit, save document, cut & paste perform operations on blocks of text, header & footer, Mail Merge, printer setup. Introduction of EXCEL. Concept of worksheet, making Charts & graphs, perform calculations & re calculations.

## **C-Language:**

Overview of C, algorithm & flow chart, datatypes. Variables & constants, operators, expressuions & assignment statements, control statements, arrays in C (One dimentional).

## **Introduction to Internet:**

Basic concepts of Internet.

## SYLLABUS

### **B. Sc. Optometry (Third Year)**

### **OCULAR DISEASE (Posterior Segment) & SYSTEMATIC DISEASES OF THE EYE**

#### **PAPER CODE: BO-301**

- Diseases of the Vitreous Humor- Congenital Anomalies. Vitreous Opacities. Hereditary Vitreous – Retinal Degeneration's. Vitreous Haemorrhage .Detachment of Vitreous Humor . Vitreous Surgery .
- Methods of clinically assessing the posterior segment ( direct & indirect ophthalmoscopy)
- Disease of the Retina- Congenital & Dev. Defects. Inflammation of the Retina(Retinitis) . Retinal Vasculitis . Oedema of the Retina. Haemorrhage of the Retina. Vascular Occlusion . Retinal Arteriosclerosis. Retinopathies . Retinal Telangiectasis. Degeneration's of the Retina. Detachment of the Retina. Surgical Procedures for Retinal Detachment . Tumours of the Retina. Phakomatoses,. Injuries of the Retina.
- Disease of the Optic Nerve- Congenital Anomalies. Papilloedema. Inflammation of the Optic Nerve(Optic- Neuritis). Ischaemic Optic Neuropathy . Optic Atrophy. Tumours of the Optic Nerve. Injuries of the Optic Nerve.
- Symptomatic Disturbances of Visual Function – Visual Field Defects . Amblyopia. Amaurosis. Night Blindness. Day Blindness. Defects in Color Vision. Congenital Word Blindness. Malingering.

#### Neuro –eye disease:

Evaluation of optic nerve disease

Clinical features of optic nerve dysfunction., Optic disc changes. Optic atrophy. Special investigation. Classification of optic neuritis

Optic neuritis and demyelination

Systemic features of multiple sclerosis, Special investigation. Optic neuritis. Other causes of optic neuritis

Parainfectious optic neuritis. Infectious optic neuritis. Non-arteritic anterior ischaemic optic neuropathy Arteritic anterior ischaemic optic neuropathy

Clinical features of giant cell arteritis. Special investigation. Arteritic anterior ischaemic optic neuropathy. Leber hereditary optic neuropathy

Hereditary optic atrophies

Kjer syndrome. Behr syndrome. Wolfram syndrome. Alcohol-tobacco amblyopia

Drug-induced optic neuropathies

#### **PAPILLOEDEMA**

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

## CONGENITAL OPTIC NERVE ANOMALIES

### *Without neurological associations*

- ◆ Tilted disc.
- ◆ Optic disc drusen.
- ◆ Optic disc pit.
- ◆ Myelinated nerve fibers.

### *With neurological associations*

#### Optic disc coloboma.

- ◆ Morning glory anomaly.
- ◆ Optic nerve hypoplasia.
- ◆ Aicardi syndrome.
- ◆ Miscellaneous anomalies.

## PUPILLARY REACTION

### Applied anatomy.

#### Abnormal pupillary reactions

- ◆ Afferent pupillary conduction defects
- ◆ Argyll robertson pupils
- ◆ Differential diagnosis of light-near dissociation
- ◆ Adie pupil
- ◆ oculosympathetic palsy (horner syndrome)

## NYSTAGMUS

### Classifications

#### Causes

- ◆ Physiological nystagmus.
- ◆ Motor imbalance nystagmus.
- ◆ Ocular nystagmus.
- ◆ nystagmoid movements.

## SUPRANUCLEAR DISORDER OF EYE MOVEMENTS

### Conjugate eye movements

- ◆ Saccadic movements.
- ◆ Smooth pursuit movements.
- ◆ Non-optical reflexes. Supranuclear gaze palsies
- ◆ Horizontal gaze palsies.
- ◆ Vertical gaze palsies.

## THIRD NERVE DISEASE

### Applied anatomy Clinical aspects

- ◆ Clinical features.
- ◆ Aberrant regeneration.
- ◆ Causes isolated third nerve palsy.

## FOURTH NERVE DISEASE

### Applied anatomy Clinical aspects

- ◆ Clinical features.
- ◆ Causes of isolated fourth nerve palsy.

## SIXTH NERVE DISEASE

### Applied anatomy Clinical aspects

- ◆ Clinical features.
- ◆ Causes.

## DISORDERS OF CHIASM

Classification Applied anatomy Applied physiology

- ◆ Hyperpituitarism.
- ◆ Hypopituitarism. Pituitary adenoma
- ◆ Clinical features.
- ◆ Special investigation.
- ◆ Treatment. Craniopharyngioma Meningioma

## DISORDERS OF RETROCHIASMAL PATHWAYS AND CORTEX

Clinical features of optic tract lesion Lesions of optic radiations

- ◆ Applied anatomy.
- ◆ clinical features.

Lesions of striate calcarine cortex Migraine

Clinical features

Management

## OCULAR MYOPATHIES AND RELATED DISORDERS

Myasthenia gravis

- ◆ Clinical features.
- ◆ Special investigations.
- ◆ Treatment.

Ocular myopathies Myotonic dystrophy

- ◆ Systemic features.
- ◆ Ocular features.

Essential blepharospasm

- ◆ Clinical features.
- ◆ Treatment.

## NEUROFIBROMATOSIS

Neurofibromatosis type-1(NF-1)

- ◆ Systemic features.
- ◆ Ocular features.

Neurofibromatosis type-2(NF-2)

## SYSTEMIC CONDITIONS & THE EYE

1. Arterial Hypertension
  - i) Pathophysiology, classification, clinical examination, diagnosis, complications, management.
  - ii) Hypertension and the eye.
2. Diabetes mellitus
  - i) Pathophysiology, classification, clinical features, diagnosis, complications, management.
  - ii) Diabetes mellitus and the eye.
3. Acquired Heart Disease – Embolism
  - i) Rheumatic heart disease
  - ii) Subacute bacterial endocarditis.
  - iii) Heart disease & the eye.

4. Malignancy
  - i) Definitions, nomenclature, characteristics of benign & malignant neoplasms.
  - ii) Grading and staging of cancer, diagnosis, principles of treatment.
  - iii) Neoplasia and the eye.
  
5. Connective Tissue Disease
  - i) Anatomy and pathophysiology: Arthritis.
  - ii) Eye and connective tissue disease.
  
6. Thyroid Disease
  - i) Anatomy and physiology of the thyroid gland.
  - ii) Classification of thyroid disease
  - iii) Diagnosis, complications, clinical features, management of thyroid disease involving eye.
  
7. Tuberculosis
  - i) Etiology, pathology, clinical features, pulmonary TB, diagnosis, complications, treatment of tuberculosis involving the eye.
  
8. Tropical Disease and the Eye
  - i) Leprosy.
  - ii) Syphilis.
  - iii) Malaria.
  
9. Vitamin deficiency and the eye
  
10. Neurological disease and the eye
  - i) Classification of neurological diseases.
  - ii) Demyelinating diseases
  - iii) Visual pathway lesions
  - iv) Papilloedema.
  
11. Genetic disorders and the eye.
12. Phacomatoses & the eye.

Reference: 1. Clinical Ophthalmology – Jack J. Kanski (Butterworth-Heinemann)  
2. Systemic Disease and the Eye – Do.

# **BINOCULAR VISION & OCULAR MOTILITY**

**PAPER CODE: BO-302**

**Grades of binocular vision**-simultaneous perception (first grade of binocular vision), fusion, stereopsis (third grade of binocular single vision). Advantages of binocular vision. Visual direction and the horopter, visual direction, corresponding point and normal retinal correspondence, horopter, physiologic diplopia. Binocular fusion-panum's area, fixation disparity, theories of binocular fusion, synergy hypothesis of panum, local sign hypothesis of hering, eye movement hypothesis of helmholts, suppression hypothesis of du tour and verhoeff, physiologic basis of fusion.

**Dihoptic stimulation**-depth with fusion and depth with diplopia, diplopia without depth, retinal rivalry and suppression, binocular lusus. Stereopsis-physiological basis of stereopsis, local and global stereopsis and fusion, stereopsis acuity neurophysiology of stereopsis.

**Depth perception**-stereopsis, nonstereoscopic clues to the perception of depth under binocular condition, monocular clues (non stereoscopic clues to spatial orientation)-parallaxic movements, linear perspective, overlap of contours, size distance from horizon, distribution of highlights, shadow, shades and light. aerial perspective

, influence of accommodation and convergence on depth perception, conclusion. Integration of the motor and sensory system into binocular vision.

## **Binocular defects:**

Binocular optical defects-anisometropia-vision in anisometropia, treatment, Binocular optical defects-aniseikonia- symptoms, clinical investigation, treatment. Binocular muscular co-ordination-orthophoria-binocular vision. Binocular muscular anomalies-heterophoria-the causes of imbalance, exophoria, esophoria, hyperphoria, cyclophoria, symptoms of heterophoria, treatment. Binocular muscular anomalies-heterotropia—the vision in concomitant strabismus, treatment. Binocular muscular co-ordination-convergence-voluntary and reflex convergence, reflex convergence, the measurement of convergence, the relation between accommodation and

convergence, binocular accommodation, fatigue of convergence. Binocular muscular anomalies-anomalies of convergence and other reading difficulties—insufficiency of convergence, convergence excess, the ophthalmologist and the reading ability of children.

## **BINOCULAR VISION TEST:**

Test for simultaneous macular perception, test for fusion, test for stereopsis-synoptophore or stereoscope test, vectograph test, titmus stereo test, random dot stereogram test, simple motor task test based on stereopsis.

Eye movements: the orbit anatomy of the extraocular muscles. Interactive dynamics of orbital mechanisms & brain stem neurophysiology – outline of extra ocular muscle control. Extra ocular muscles-their function & nerve supply. Mechanics of actions of extra ocular muscles -cross sectional area of muscle, length of muscle. Arc of contact, muscle plane, Muscle axis of rotation.

Physiology of ocular movement – Basic Kinematics, ( position of gaze, Fick's axes)

Ocular movements - Monocular Movements ( Adduction, Abduction, supraduction, Infraduction, Incycloduction, excycloduction). Binocular Movements –VERSIONS- (saccadic & pursuit movement, position maintenance movements, stabilization movements & their characteristics). VERGENCES – (Convergence, divergence, vertical vergence), Supra nuclear control of eye movements.( the superior colliculi, the occipital cortex, the psycho optical reflexes & fixation.

Oculomotor system: vestibular – ocular reflexes, optokinetic reflexes. Diagnosis & clinical aspects of ocular anomalies & disorders.

Converge through a spectacle lens. Prismatic effects in spectacle lenses.

Text:

Binocular vision Anomalies & Procedures for vision therapy, By Griffies

## CONTACT LENS – I & II

### **PAPER CODE: BO-303**

#### **Contact Lens – I**

- a) Contact lens history & development. Benefits of contact lens over spectacle. Manufacturing methods-spin cast, Lethé cut, Cast modeling.
- b) Slit lamp Examination technique
- c) Corneal topography- Keratometry & Extended Keratometry
- d) Contact lens optics-Contact lens & spectacle lens. Back vertex calculation. Contact lens & Tear lens system.
- e) Classification of contact lens & its material ( soft & RGP ); Material property.
- f) Contact lens terminology. RGP & soft lens design. FDA classification of contact lens material.
- g) Patient selection & prescreening. Indications & contra indications of contact lens.
- h) Soft spherical contact lens fitting & Assessment.
- i) Soft contact lens case & maintenance.
- j) Spherical RGP contact lens fitting & assessment.
- k) RGP contact lens care & maintenance.

#### **Contact Lens - II**

1. Contact lens fitting in astigmatism.
2. Contact lens fitting in keratokonus.
3. Contact lens fitting in children.
4. RGP lenses – low D.K. and high D.K. lenses.
5. Instructions regarding handling and care of lenses.
6. Cosmetic and prosthetic contact lenses.
7. Extended wear lenses versus Daily wear
8. Disposable lenses
9. Contact lens – Toric, Bifocal, Multifocal.
10. Therapeutic lenses / Bandage lenses.
11. Contact lens solutions – principle of action, compositions
12. Ordering contact lenses – writing prescription to the lab.
13. Contact lens – modifications of finished lenses (RGP).
14. Checking the parameters.
15. Recent advances in contact lenses.
16. Follow up examinations
17. Contact lens complications and their management.
18. Prosthetic eye fitting procedures & conformers.

#### **REFERENCES:**

1. Fitting Guide for Rigid and Soft Contact Lenses – H. A. Stein, Slatt, M. L. Freeman (Mosby).
2. IACLE Module.
3. Contact Lenses (The CLAO Guide to Basic Science and Clinical Practice). – Kendall/Hunt Publishing Co.
4. Text Book of Contact Lenses – V. K. Dada (Jaypee).



## **Contact Lens –I & II (Practical)**

### **Contact Lens - I**

- a) Routine clinical procedure for contact lens patient & selection of contact lens.
- b) Keratometry & slit lamp Biomicroscopy.
- c) Spherical soft & Spherical RGP contact lens fitting: selection of contact lens Base curve, diameter & Power & fitting Assessment .
- d) Insertion & Removal of soft & RGP contact lens.
- e) Contact lens & maintenance.

### **Contact Lens – II**

- 1. Fitting and assessment of contact lenses – steep, flat, optimum on spherical cornea.
- 2. Fitting and assessment of contact lenses – steep, flat, optimum on toric cornea with spherical lenses.
- 3. Fitting and assessment of contact lenses – steep, flat, optimum on toric cornea with toric lenses.
- 4. Teaching the patient to insert and remove contact lenses.
- 5. Writing Contact Lens prescriptions.

## **LOW VISION AID & VISUAL REHABILITATION**

**PAPER CODE: BO-304**

- a) Definition-old, new, proposed
- b) Grades of low vision
- c) Statistics/ Epidemiology
- d) Relation between disorder, impairment & handicapped
- e) Low vision optics
  - Magnification-relative distance/ relative size/ approach/angular
  - Optics of Galilian & Keplarian telescope- advantage/disadvantage, significance of exit & entrance pupil.
  - Optics of spectacle magnifier/ determination/ calculation/ disadvantage/advantage. Optics of stand magnifier, significance of equivalent viewing distance & calculations. Telescope-distance/ near/ telemicroscope/ monocular/ binocular/ bioptic.
  - Determination of decentration of lenses /prism/calculation/Lebenson's formula/simple diotric formula.
  - Hand held magnifier-illuminated/ non-illuminated.
  - Spectacle magnifier / half eye/ prism correction/ bar magnifier/ CCTV/ magni-cam/ low vision imaging system or V-max / contact lens & IOL telescope.
- f) Low vision examination:
  - Task/ Goal oriented history-medical/ visual/ psychological history/ task analysis/ mobility/ distance vision/ near vision / daily living/ illumination/ work & school.
  - Visual acuity measurement-distance/ near/ use of log MAR chart ( distance & near)/ light house, picture chart/ visual field/ Amsler chart/ contrast sensitivity/ overview of glare testing. Low vision refraction.
- g) Assessment & prescription of low vision devices-optical/ non-optical/ rehabilitation services. Non- optical devices-pen/umbrella/ boldline note book/ illumination/ letter writer/ environmental modification/ signature guide/ needle threader/ eccentric viewing strategies.
- h) Overview of Rehabilitation Services:- definition/ implementation/ vocational guidance/ educational guidance/ mobility & orientation training / special teacher/ special school/ Braille system/ integrated system/referral center- activity/ support/ loan.
- i) Overview of systematic / retinal diseases in relation to low vision:- acromatopsia/ LMBB syndrome/ labers congenital anomaly/ down syndrome/ retinitis pigmentosa/ diabetic retinopathy/ optic atrophy/ albinism/ aniridia.
- j) Counseling of low vision patient/ parents/ guardians/relatives.

### **Low Vision Aids & Visual Rehabilitation (Practical)**

- a) Case history.
- b) Assessment.
- c) Application of devices.
- d) Rehabilitation.

# **CLINICAL REFRACTION & APPLIED OPTOMETRY AND ORTHOPTICS**

## **CLINICAL REFRACTION**

**PAPER CODE: BO-305**

- a) Assessment of children Vision & Paediatric evaluation, diagnosis & management.
- b) Strabismus & Aniblyopia.
- c) Non- Strabismic Biocular Disorders.
- d) Neuro- Optometric Rehabilitation.
- e) Evaluation, Diagnosis & Optometric management of children with mental retardation C.P. Dyslexia, Multiple Sensory Motor Handicap.
- f) Visual Disorders in senior citizens, evaluation, diagnosis+ management.
- g) Sports vision.
- h) Refraction in special cases ( pseudophakia , aphakia, irregular corneal astigmatism , coloboma of iris, choroids, retina, nystagmus, post R.K., PRK, LASIK)
- i) Congenital cataract, glaucoma.
- j) Patient with low vision.
- k) Patient with anisometropia( Anisokonia)
- l) Monocular & binocular subjective refraction.

## **APPLIED OPTOMETRY AND ORTHOPTICS**

### **1. ORTHOPTIC INSTRUMENTS**

- ◆ Prism Bar
- ◆ Synoptophore
- ◆ Maddox Wing
- ◆ Maddox Rod
- ◆ Red Green Goggles
- ◆ Hess Screen
- ◆ Risley Prisms

- ◆ Motor signs in squint

#### Investigative procedures

- A) Head position: Face turn, chin position, Head tilt.
- B) Cover test & cover-uncover tests
- C) Maddox wing to assess heterophoria.

- ◆ Assessment of degree of squint
  - a) Hirschbag test.
  - b) Prism bar test.
  - c) Krimsky test
  - d) Synoptophore test

- ◆ Assessment of ocular motility status
  - a) Hess chart
  - b) Diplopia testing
  - c) Bielschowskys Head tilting test
  
- ◆ Assessment of visual sensory status in squint. Amblyopia  
Suppression  
Binocular single vision – SMP, Fusion, Stereopsis.
  
- ◆ Mechanisms leading to squint  
Types of squint – a) latent / manifest
  - b) horizontal / vertical
  - c) paralytic / concomitant

## **Orthoptic Treatment Procedures**

- Management of –
- Convergence insufficiency
  - Amblyopia
  - Suppression
  - ARC
  - Use of prism -  
For Exercise & correction

### 7. AMBLYOPIA

- Definition.
- Neuropathology.
- Classification.
- Clinical Features.
- Treatment.
  - a) Occlusion.
  - b) Penalisation.
  - c) Role of drugs.

## **Clinical Refraction –II (Practical) (Geriatric & Pediatric Optometry)**

1. Assessment of children Vision & Paediatric evaluation, diagnosis & management.
2. Strabismus & Aniblyopia.
3. Non- Strabismic Biocular Disorders.
4. Neuro- Optometric Rehabilitation.
5. Evaluation, Diagnosis & Optometric management of children with mental retardation C.P. Dyslexia, Multiple Sensory Motor Handicap.
6. Visual Disorders in senior citizens, evaluation, diagnosis+ management.
7. Sports vision.
8. Refraction in special cases ( pseudophakia , aphakia, irregular corneal astigmatism , coloboma of iris, choroids, retina, nystagmus, post R.K., PRK, LASIK)
9. Congenital cataract, glaucoma.
10. Patient with low vision.
11. Patient with anisometropia( Anisokonia)
12. Monocular & binocular subjective refraction.

## **APPLIED OPTOMETRY AND ORTHOPTICS (Practical)**

1. Demonstration of following Orthoptic instruments/methods and their uses –
  - ◆ Prism Bar
  - ◆ Synoptophore
  - ◆ Maddox Wing
  - ◆ Maddox Rod
  - ◆ Red Green Goggles
  - ◆ RAF Gauge
  - ◆ Cover test
  - ◆ Hirschberg test
  - ◆ Krimsky test
  - ◆ Diplopia charting
  - ◆ Visuoscopy
  - ◆ Accommodative flipper
2. Orthoptic Investigative & Therapeutic Procedure.
3. Case records.
4. Case Handling

# **PUBLIC HEALTH & COMMUNITY OPTOMETRY and BIostatistics**

**PAPER CODE : BO-306**

1. Concept of public health.
2. Principles of primary, secondary and tertiary care.
3. Planning of health services.
4. Health economics
5. Health manpower development-a)Basic O.T Practices  
b) Familiarity with use of Operating Microscope
6. NPCB and refractive blindness – optometrist’s role as primary health care provides.
7. Health cares insurance including role of TPA.
8. Ocular emergencies –
  - a) Foreign body
  - b) Eye Pain
  - c) Watering
  - d) Injuries-perforating, non perforating & chemical

# BIOSTATISTICS

## 1. Introduction:

Definition, Scope, Application and uses of Biostatistics, Types of Statistics – Medical Statistics, Health Statistics, Vital Statistics & Biostatistics, Scales of measurement – Nominal, Ordinal, Interval & Ratio Scale.

## 2. Data & Its Presentation:

Types of Variables - Simple, Composite, Dependent, Independent, Latent & Random Variables.

Types of Data – Discrete, Continuous, Qualitative, Quantitative, Grouped, Ungrouped, Primary & Secondary. Charts and diagrams for qualitative & quantitative data.

**Qualitative Data Diagram:** Simple, Multiple, Component, Pie or Sector diagram, Pictogram.

**Quantitative Data Diagram:** Histogram, Frequency Curve, Frequency Polygon, Cumulative Frequency Curve (Ogive), Scatter Diagram,

## 3. Measure of location – Average and Percentiles:

Measure of Central Tendency – Mean, Median, Mode, Geometric Mean  
Measures of Location - Quartiles, Deciles, Percentiles.

## 4. Variability & its measures:

Types of Variability- Biological, Real, Experimental Variability.

Measures of Dispersion– Range, Mean Deviation, Standard Deviation, Variation, Coefficient of Variation.

Normal Distribution – Normal Curve

Divergence from normal curve – Skewness & Kurtosis.

## 5. Probability :

Definition, Uses of Probability, Addition theorem & Multiplication theorem.

## 6. Sample size and sampling technique:

Some common terminology used in statistics - Parameter, Statistics, Population, Sample, Sampling Unit, Sampling frame, Sample size determination for quantitative and qualitative data.

**Types of Sampling** – Probability Sampling & Non Probability Sampling.

**Probability Sampling:** Simple random sampling, Stratified sampling, Systematic sampling, Cluster sampling.

**Non-Probability Sampling:** Purposive sampling, Judgment sampling, Multistage sampling, Convenience sampling.

## 7. Sampling variability and Null hypothesis:

Standard error, Standard error of mean, Standard error of proportion, Confidence limits, Confidence Interval, Level of significance, p-value, Type-I & Type-II error. One tailed and two tailed test, Degree of freedom.

## 8. Difference between proportion:

$X^2$ -test, Z-test for proportion.

## 9. Difference between means:

Paired t-test, Independent t-test.

## 10. Correlation & Regression: Relation between two variables & Regression.

**Applications:** Collection, presentation and analysis of hospital statistical data with examples. Collection, presentation and analysis of optometric and ophthalmology data with few examples.

## **Internship**

Duration of the Internship is One Year. After passing third academic year candidate is eligible for one year internship. Internship can be pursued from Rama University, Faculty of Paramedical Sciences or elsewhere from any Institute, Medical College, Hospital recognized by State Medical Faculty. After completion of internship, the name of candidate completing full course will be sent to U.P. State Medical Faculty for registration, and will be awarded degree by Rama University.

