PROGRAM CURRICULUM

DOCTOR OF OPTOMETRY PROGRAM

(INTERNATIONAL PROGRAM)

CHULABHORN INTERNATIONAL COLLEGE OF MEDICINE

THAMMASAT UNIVERSITY, RANGSIT CAMPUS

INDEX

PROGRAM CURRICULUM

1. Program learning outcomes

2.1 Domains of Knowledge

K 1: Learners can accurately explain the basic principles of medical science.

K 2: Learners can accurately explain the theories and principles of optometric science.

K 3: Learners can accurately explain theories and principles of optometric and vision science and how they relate to professional practice.

2.2 Domains of Skill

S1: Learners can communicate effectively with stakeholders in both Thai and English.

S2: Learners can effectively select optometric examinations.

- In accordance with international standards
- Accurate advice to patients and refer patients efficiently

S3: Learners demonstrate proficient coordination skills and effective team collaboration.

- Ability to work with others.
- Collaboration with multidisciplinary teams in medical care.
- Perform the duties and responsibilities as assigned.

S4: The learner can develop and manage work.

- Utilise information technology and digital technology in professional practice.
- Plan, develop, and manage related tasks effectively.
- The knowledge can be applied to further development, self-study, or continued learning.

2.3 Domains of Ethics

E1: Learners can decide based on ethical principles and scientific evidence

- With patient safety as the top priority
- In a people-centred way, and with respect for the rights and responsibilities of all parties.

E2 Learners are capable of explaining and applying the principles of law, morality, ethics, and commendable professional practices in their work.

2.4 Domain of Characters

C1: Demonstrate responsibility and understand their rights and duties

- Respect the rights and duties of others
- Respect equality and individual differences

- The spirit of Thammasat: a public-minded spirit

C2: Learners possess the capacity for ongoing self-improvement.

- Able to develop into someone ready to embrace new things and learn continuously.
- Possesses skills in integrating and applying knowledge in work practices.
- Able to study, research, and further develop knowledge

C3: Demonstrate behaviour appropriate to being optometry professionals

- Express themselves appropriately as optometrist
- According to the situation and circumstances
- Can adapt and interact with others properly.

2. Curriculum structure

Students must register for a minimum of 203 credits, taking various courses in accordance with the curriculum's structure, components, and requirements as follows.

1) General Education	30	Credits
2) Specialized Subject	167	Credits
2.1) Basic Professional Subject	72	Credits
2.1.1) Basic Medical Science Course	34	Credits
2.1.2) Optometric and vision science	38	credits
2.2) Optometry professional subject	95	credits
3) Elective Subject	6	Credits
Total	**203**	**credits**

3. Study Plan

Year 1		
SEMESTER 1		**CREDIT**
EL 105	English Communication Skills	3(3-0-6)
CMN 111	Chemistry and organic chemistry for medical sciences	3(3-0-6)
CMN 112	Chemistry and organic chemistry laboratory for medical sciences	1(0-2-1)
CMM 110	Medical Biology	3(3-0-6)
CMM 111	Medical Biology Laboratory	1(0-2-1)
CMM 120	Engagement in Health Science	3(3-0-6)
CMM 122	Innovation and Communication in Healthcare Sectors	3(3-0-6)
CMM 123	Self-reflection and Personal Development for Healthcare Professionals	3(3-0-6)
Total		**20**
SEMESTER 2		**CREDIT**
CMM 107	Principle of Physics in Daily Life	3(3-0-6)
CMM 121	Applied Medical Sciences and Sustainability	3(3-0-6)
CMM 124	Entrepreneurial Competencies Development in Healthcare	3(3-0-6)
CMM 217	Fundamentals of Biomedical Sciences 1	4(3-2-7)
CMM 218	Fundamentals of Biomedical Sciences 2	3(2-2-5)
SC 186	Physics Laboratory	1(0-3-0)
LAS 101	Critical Thinking, Reading, and Writing	3(3-0-6)
Total		**20**

Year 2	
SEMESTER 1	**CREDIT**
CMM 126 Information Technology Law for Healthcare Professionals	3(3-0-6)
CMM 219 Integrated Biomedical Sciences 1	3(2-2-5)
CMM 220 Integrated Biomedical Sciences 2	3(2-2-5)
CMM 221 Integrated Biomedical Sciences 3	3(2-2-5)
CMM 222 Patient Assessment and Symptomatology	2(2-0-4)
CMO 211 Introduction to Optometry and Basic Optometric Practice	2(1-2-3)
Total	**16**
SEMESTER 2	**CREDIT**
CMN 481 Applied Psychology in Clinical Health Care	2(2-0-4)
CMM 125 Biostatistics and Epidemiology for Medical Science	3(3-0-6)
CMO 212 Integrated Ocular System	4(3-2-7)
CMO 213 Neuroscience for Optometry	3(2-2-5)
CMO 214 Ocular Microbiology	3(2-2-5)
CMO 221 Clinical Interview and History Taking in Optometry	2(1-2-3)
EL 296 Academic English for Science Disciplines 1	3(3-0-6)
Total	**20**

Year 3	
SEMESTER 1	**CREDIT**
CMO 311 Medical and Ocular Biochemistry	3(2-2-5)
CMO 312 Theoretical Optometry	3(3-0-6)
CMO 313 Geometrical Optic	3(3-0-6)
CMO 314 Neurophysiology of Vision	2(2-0-4)
CMO 315 Vision Science 1: Monocular vision	2(2-0-4)
CMO 321 Optometry Diagnosis Procedures 1: Refractive Anomalies	3(2-2-5)
CMO 322 Ocular Diseases and Pathology 1: Anterior Segment	3(2-2-5)
Total	**19**
SEMESTER 2	**CREDIT**
CMO 316 Vision Science 2: Binocular vision	2(2-0-4)
CMO 317 Ophthalmic Optics	3(3-0-6)
CMO 318 Ocular Pharmacology	2(1-2-3)
CMO 323 Optometry Diagnosis Procedures 2: Binocular vision	4(2-4-6)
CMO 324 Ocular Diseases and Pathology 2: Posterior Segment	3(2-2-5)
CMO 325 Ophthalmic Dispensing	4(2-4-6)
Total	**18**

Year 4	
SEMESTER 1	**CREDIT**
CMN 411 Research Ethics and Methodology	2(2-0-4)
CMO 411 Epidemiology and Optometry in Community	3(2-2-5)
CMO 421 Introduction to optometry clinical practice	2(1-2-3)
CMO 422 Neuro-Ophthalmic Diseases and Pathology	2(2-0-4)
CMO 423 Systemic Disease & Its Ocular Manifestation	2(2-0-4)
CMO 431 Contact Lens 1	3(2-2-5)
CMO 432 Visual Therapy	3(2-2-5)
Total	**17**
SEMESTER 2	**CREDIT**
CMO 412 Socioeconomic and Business Aspects of Optometry	3(2-2-5)
CMO 424 Optometry Clinic 1	3(1-4-4)
CMO 433 Infants & Pediatric Optometry	3(2-2-5)
CMO 434 Contact Lens 2	3(2-2-5)
CMO 435 Visual Perception and Learning Disability	2(2-0-4)
Elective Subject	2
Total	**16**

Year 5	
SEMESTER 1	**CREDIT**
CMO 521 English for Clinical Practice in Optometry	1(1-0-2)
CMO 522 Optometry Clinic 2	6(0-12-6)
CMO 531 Geriatric Optometry	2(2-0-4)
CMO 532 Low Vision and Rehabilitation	2(1-2-3)
CMO 533 Applied Ocular Therapeutics	2(1-2-3)
CMO 541 Research Project 1	2(0-4-2)
Elective Subject	2
Total	**17**
SEMESTER 2	**CREDIT**
CMO 523 Legal Aspects and Professional Ethics in Optometry	1(1-0-2)
CMO 524 Optometry Clinic 3	7(0-14-7)
CMO 542 Research Project 2	2(0-4-2)
Elective Subject	2
Total	**12**

Year 6	
SEMESTER 1	**CREDIT**
CMO 651 Optometry Clinical Clerkship 1	14
Total	**14**
SEMESTER 2	**CREDIT**
CMO 652 Optometry Clinical Clerkship 2	14
Total	**14**

4. Course list

1) General Education Course

General Education Course 30 Credits

Students are required to take the general education courses in the curriculum, totaling no less than 30 credits. The structure and components of the general education course are divided into five categories as follows.

Section 1: Awareness of the World and Society

CMM	124	Entrepreneurial Competencies Development in Healthcare Professionals	3(3-0-6)
CMM	126	Information Technology Law for Healthcare Professionals	3(3-0-6)

Section 2: Aesthetics and Communication Skills

CMM	123	Self-reflection and Personal Development for Healthcare Professionals	3(3-0-6)
EL	105	English Communication Skills	3(3-0-6)
LAS	101	Critical Thinking, Reading, and Writing	3(3-0-6)

Section 3: Mathematics, Science, and Technology

CMM	125	Biostatistics and Epidemiology for Medical Science	3(3-0-6)

Section 4: Well-being and Future Skills

CMM	121	Applied Medical Sciences and Sustainability	3(3-0-6)
CMM	122	Innovation and Communication in Healthcare Sectors	3(3-0-6)
EL	296	Academic English for Science Disciplines 1	3(3-0-6)

Section 5: Social Service and Learning from Practice

CMM	120	Engagement in Health Science	3(3-0-6)

2) Specialized subject

2.1) Basic Professional Subject			**72 Credits**
	2.1.1) Basic Medical Science Course		**34 Credits**
CMN	111	Chemistry and organic chemistry for medical sciences	3(3-0-6)
CMN	112	Chemistry and organic chemistry laboratory for medical sciences	1(0-2-1)
CMN	411	Research Ethics and Methodology	2(2-0-4
CMN	481	Applied Psychology in Clinical Health Care	2(2-0-4)
CMM	107	Principle of Physics in Daily Life	3(3-0-6)
CMM	110	Medical Biology	3(3-0-6)
CMM	111	Medical Biology Laboratory	1(0-2-1)
CMM	217	Fundamentals of Biomedical Sciences 1	4(3-2-7)
CMM	218	Fundamentals of Biomedical Sciences 2	3(2-2-5)
CMM	219	Integrated Biomedical Sciences 1	3(2-2-5)
CMM	220	Integrated Biomedical Sciences 2	3(2-2-5)
CMM	221	Integrated Biomedical Sciences 3	3(2-2-5)
CMM	222	Patient Assessment and Symptomatology	2(2-0-4)
SC	186	Physics Laboratory	1(0-3-0)
	2.1.2) Optometric and vision science		**38 credits**
CMO	211	Introduction to Optometry and Basic Optometric Practice	2(1-2-3)
CMO	212	Integrated Ocular System	4(3-2-7)
CMO	213	Neuroscience for Optometry	3(2-2-5)
CMO	214	Ocular Microbiology	3(2-2-5)
CMO	311	Medical and Ocular Biochemistry	3(2-2-5)
CMO	312	Theoretical Optometry	3(3-0-6)
CMO	313	Geometrical Optic	3(3-0-6)
CMO	314	Neurophysiology of Vision	2(2-0-4)
CMO	315	Vision Science 1: Monocular vision	2(2-0-4)
CMO	316	Vision Science 2: Binocular vision	2(2-0-4)

CMO	317	Ophthalmic Optics	3(3-0-6)
CMO	318	Ocular Pharmacology	2(1-2-3)
CMO	411	Epidemiology and Optometry in Community	3(2-2-5)
CMO	412	Socioeconomic and Business Aspects of Optometry	3(2-2-5)

2.2) Optometry professional subject **95 credits**

CMO	221	Clinical Interview and History Taking in Optometry	2(1-2-3)
CMO	321	Optometry Diagnosis Procedures 1: Refractive Anomalies	3(2-2-5)
CMO	322	Ocular Diseases and Pathology 1: Anterior Segment	3(2-2-5)
CMO	323	Optometry Diagnosis Procedures 2: Binocular vision	4(2-4-6)
CMO	324	Ocular Diseases and Pathology 2: Posterior Segment	3(2-2-5)
CMO	325	Ophthalmic Dispensing	4(2-4-6)
CMO	421	Introduction to optometry clinical practice	2(1-2-3)
CMO	422	Neuro-Ophthalmic Diseases and Pathology	2(2-0-4)
CMO	423	Systemic Disease & Its Ocular Manifestation	2(2-0-4)
CMO	424	Optometry Clinic 1	3(1-4-4)
CMO	431	Contact Lens 1	3(2-2-5)
CMO	432	Visual Therapy	3(2-2-5)
CMO	433	Infants & Pediatric Optometry	3(2-2-5)
CMO	434	Contact Lens 2	3(2-2-5)
CMO	435	Visual Perception and Learning Disability	2(2-0-4)
CMO	521	English for Clinical Practice in Optometry	1(1-0-2)
CMO	522	Optometry Clinic 2	6(0-12-6)
CMO	523	Legal Aspects and Professional Ethics in Optometry	1(1-0-2)
CMO	524	Optometry Clinic 3	7(0-14-7)
CMO	531	Geriatric Optometry	2(2-0-4)
CMO	532	Low Vision and Rehabilitation	2(1-2-3)
CMO	533	Applied Ocular Therapeutics	2(1-2-3)
CMO	541	Research Project 1	2(0-4-2)
CMO	542	Research Project 2	2(0-4-2)

CMO	651	Optometry Clinical Clerkship 1	14(0-42-0)
CMO	652	Optometry Clinical Clerkship 2	14(0-42-0)

3) Elective Subject **6 Credits**

Students can choose any course offered at Thammasat University as an elective, with a minimum of 6 credits. This also includes courses offered by the Chulabhorn International College of Medicine, for example.

CMO	481	Emergency detection and prehospital management	2(2-0-4)
CMO	581	Instruments and Technology in Optometry	3(2-2-5)
CMO	582	Sport Vision and Occupational Optometry	2(2-0-4)

5. Course descriptions

1) General Education Subjects

Section 1: Awareness of the World and Society

CMM124 Entrepreneurial Competencies Development in Healthcare Professionals 3(3-0-6)

Entrepreneurship in general, how to become entrepreneur, Ethics of the entrepreneurship, Identifying and exploiting opportunities, Decision making, Strategic thinking, Taking and managing risk, Different types of companies and organizations in the healthcare sector, Establishment of the company (business idea and plan) and the running of a company, Marketing, Production and work quality, Legislation, Customer orientation, Financial management, Networking, Knowledgeable of Legal Regulations.

CMM126 Information Technology Law for Healthcare Professionals 3(3-0-6)

Study the basic principles of the rule of law and the fundamentals of private and public law for healthcare professionals. Legal issues in areas such as digital data, the PDPA (Personal Data Protection Act), Intellectual Property, the Social Security Fund, the Workmen's Compensation Fund, and the National Health Act focus on legal discussions that are important in today's medical practice that is applied in real life.

Section 2: Aesthetics and Communication Skills

CMM123 Self-reflection and Personal Development for Healthcare Professionals 3(3-0-6)

Managing and adaptation to university life. Understanding self-awareness and respect others people. Development of soft skill, social skill, mindset of life and emotional intelligence leading to future planning in all dimensions as well as developing lifelong learning to coexist peacefully with others. Learning to live harmoniously and respectfully with others and the society.

LAS101 Critical Thinking, Reading, and Writing 3(3-0-6)

Development of critical thinking through questioning, analytical, synthetic and evaluation skills. Students learn how to read without necessarily accepting all the information presented in the text, but rather consider the content in depth, considering the objectives, perspectives, assumptions, bias and supporting evidence, as well as logic or strategies leading to the author's conclusion. The purpose is to apply these methods to students' own persuasive writing based on information researched from various sources, using effective presentation techniques.

EL105 English Communication Skills 3(3-0-6)

Development of English communication skills, including listening, speaking, reading and writing. Practice of language, vocabulary and expressions used in academic and social contexts.

Section 3: Mathematics, Science, and Technology

CMM125 Biostatistics and Epidemiology for Medical Science 3(3-0-6)

Principles and concepts of biostatistics and epidemiology for biomedical science; Study design in biomedical research; Occurrence relation of disease/ illness and its determinants; Measure of disease frequency and measure of effect; Review the concepts of descriptive statistics and inferential statistics especially estimation and hypothesis testing; Critical appraisal of the medical literature.

Section 4: Well-being and Future Skills

CMM121 Applied Medical Sciences and Sustainability 3(3-0-6)

The study of human and living life with sustainable well-being in context of natural and built environment. Economy of well-being, social determinants of health. Contemporary society and culture in life and health aspects. Human health and confronting with global change in various perspectives.

CMM122 Innovation and Communication in Healthcare Sectors 3(3-0-6)

Psychology of Art and Creativity, Creative Thinking, Techniques and Tools for Success, Creative Problem Solving, Design Thinking and Creativity for Innovation, Types of innovation, Innovation Toolbox, reviewing patents / intellectual property, identifying an inventive opportunity, Competitive strategy projecting trends, as well as communication of these ideas that lead to suitable results in social and healthcare sector.

EL296 Academic English for Science Disciplines 1 3(3-0-6)

Development of English listening, speaking, reading, and writing skills for scientific academic purposes, Practice of summarizing, giving definitions, describing processes, giving instructions, explaining cause and effect relationships, and describing compare and contrast relationships.

Section 5: Social Service and Learning from Practice

CMM120 Engagement in Health Science 3(3-0-6)

Democracy, characteristics of civic citizen including respecting the rules, respecting others' rights, respecting differences, respecting equality, self-dependence, social responsibility, and thinking ability, civic engagement, environmental issues, problems in country and world, Sustainable Development Goals (SDGs), first aid course, community visiting, project creation and implementation related to health science.

2) Specialized subject

2.1) Basic Professional Subjects

2.1.1) Basic Medical Science Subjects

CMN111 Chemistry and organic chemistry for medical sciences 3(3-0-6)

Protons, neutrons and electrons; Covalent bonding; non-covalent bonding; Free electron pairs and chemical reactions; Elements; Solids, liquids, gases and solutions; Thermodynamics and kinetics; Acids and bases; Solubility and complexation; The chemistry of life; Functional groups and their properties; Biological molecules; Clinical chemistry; Electrons and photons; Spectroscopy. Molecular structure and properties of organic compounds, classification and nomenclature of various functional groups of organic molecules, stereochemistry, stereoisomer.

CMN112 Chemistry and organic chemistry laboratory for medical sciences 1(0-2-1)

Prerequisite: Have taken CMN 111 or currently taking CMN 111 in the same semester.

Experiments related to contents to CMN 111.

CMN411 Research Ethics and Methodology 2(2-0-4)

Introduction to responsible research; relevant information for initiating research; critical reading and analysis; guidelines for good practices, ethics and regulations in bio-clinical sciences; responsible protocol writing; planning and setting up experiment/research; responsible peer review; good data management practice and quality standards; considerations for report and publication; ethical issues in publication; and presentation of research results.

CMN481 Applied Psychology in Clinical Health Care 2(2-0-4)

Examines how psychological, social, and behavioral factors interact with and affect people in maintaining their health, personality development behavioral change, coping with stress, loss and pain, obtaining medical treatment and recovering from serious illness, communication in health care practice, principle and practice of counseling.

CMM107 Principle of Physics in Daily Life 3(3-0-6)

The physical principles applying for medical and health science technology students. Focusing on the classical mechanics and topics including matter, motion, force, work, energy, power, fluids, principle of thermodynamic, principle of physic in daily life in human physiological related topics and the example in the applications of physics to medical research, diagnosis and treatment.

CMM110 Medical Biology 3(3-0-6)

Cells and organelles, cell cycle and cell division, the biomolecules and metabolism, basic genetics, patterns of inheritance, the diversity of microorganisms and parasites, tissue levels and human bones, nervous system, human nutrition and digestive system, endocrine system, circulation and gas exchange, reproduction and development, body's defenses against disease.

CMM111 Medical Biology Laboratory 1(0-2-1)

Prerequisite: Have taken CMM110 or currently taking CMM110 in the same semester.
Experiments related to contents to CMM110.

Laboratory on the use of light microscope, prokaryotic and eukaryotic cells, plant and animal cells, mitosis and meiosis, carbohydrate tests, DNA extraction and analysis, the diversity of microorganisms, surface anatomy and human bone, reflex functions and somatic sensation, blood circulation and gas exchange through the heart to the lungs, antigen-antibody interaction.

CMM217 Fundamentals of Biomedical Sciences 1 4(3-2-7)

Structures and functional processes of human body from the molecular level to the cells, homeostasis of biomolecules and basic medical biochemistry, inheritance and mechanism of gene action, human genome and mutation, homeostasis and physiology of cells, internal and external cell interactions such as microbes, drugs and chemical reagents, cell growth and differentiation, cell senescence and apoptosis, differentiation of cell into tissue and organ, fundamental pathology and pathophysiology of cell and tissue.

CMM218 Fundamentals of Biomedical Sciences 2 3(2-2-5)

Pathogenic microorganisms, including bacteria, viruses, fungi and parasites, life cycle of paracytes, pathogenesis, mechanism of disease, clinical symptoms, diagnosis, communicable disease, epidemiology, prevention, disease control, method of collecting specimens for diagnosis, basic knowledge of immunity, defensive system through cell and secretion, pathological state caused by immune system disorders, immune reactions in the body to various conditions and defects in the immune system, application of immunological knowledge in the diagnosis of underlying pathology and pathophysiology of infection.

CMM219 Integrated Biomedical Sciences 1 3(2-2-5)

Integration of basic anatomy and physiology knowledge of the nervous system and musculoskeletal system. The pathology and pathophysiology underlying those organ systems. Fundamental pharmacology, basics mechanism of drug action on various systems in the body. Clinical application and adverse drug effects.

CMM220 Integrated Biomedical Sciences 2 3(2-2-5)

Integration of basic anatomy and physiology knowledge of respiratory system, circulatory system, hematology and digestive system. The pathology and pathophysiology underlying those organ systems. Fundamental pharmacology, basics mechanism of drug action on various systems in the body. Clinical application and adverse drug effects.

CMM221 Integrated Biomedical Sciences 3 3(2-2-5)

Integration of basic anatomy and physiology knowledge of urinary system, reproductive system and hormones. The pathology and pathophysiology underlying those organ systems. Fundamental pharmacology, basics mechanism of drug action on various systems in the body. Clinical application and adverse drug effects.

CMM222 Patient Assessment and Symptomatology 2(2-0-4)

Systematic basic health assessment, clinical skills such as interviewing, history taking, physical examination, medical recording, specimen collection, laboratory and radiology investigation and result interpretation, signs and symptoms of common diseases, basic instruments commonly used in medical care, basic practice in operating room and patient unit, principle of counseling patient and relatives, assessment of patient problems, clinical analysis, reasoning and decision making, communication and ethical practice.

SC186 Physics Laboratory 1(0-3-0)

Laboratory practices involving measurement and errors, motion, mirrors and lenses, sound waves, electric fields, electrical instruments, gas laws and modern physics.

2.1.2) Optometric and vision science

CMO211 Introduction to Optometry and Basic Optometric Practice 2(1-2-3)

The meaning of optometrist and thier role of practice. The history of optometry and the development of scientific knowledge which are related to optometry. Basic knowledge in optometric science, basic equipments for optometrist and preliminary test in optometry.

CMO212 Integrated Ocular System 4(3-2-7)

This integrated course, starting with the development of the eye and visual system, the gross, microscopic and ultra structure of ocular tissues. allows the student to understand and appreciate the ocular anatomy, physiology, and ocular pathophysiology. Ocular motility; kinematics of eye movements, the relationship of the eye to the vascular supply of the head and the nervous system. The physiology of the smooth muscles of the eye, the lacrimal apparatus, the cornea, the iris, the lens, the ciliary body and the vitreous body. Production and drainage of tear and aqueous. The nerve functions relate to eye and vison. Ocular pathology, basis of disease processes in anatomical, histological and physiological. Genetic contributions to systemic and ocular disease.

CMO213 Neuroscience for Optometry 3(2-2-5)

This course covers the basic principles of structure, function, and organization of the human nervous system. The central nervous system, cerebral spinal fluid and meninges, histology of neurons, neural development, degeneration, and regeneration, basic principles of neurophysiology such as membrane potential and action potential as well as synaptic transmission. Structure and function of sensory systems and motor systems, their pathways and the consequence of pathology are included. The long-term objective is to provide the student of optometry, as a professional health care provider, with the capability to recognize neurological issues in his patients based on an understanding of the relationship of the visual system to the rest of the nervous system.

CMO214 Ocular Microbiology 3(2-2-5)

Basic knowledge of microorganisms causes ocular diseases in morphology, epidemiology, cultivation, ocular specimen collection, laboratory testing, sterilization, clinical signs of infection, response to foreign substances.

CMO311 Medical and Ocular Biochemistry 3(2-2-5)

General principle of medical biochemistry. A detailed study of chemical compositions and their role in metabolism in the human body and ocular biochemistry in detail. Ocular biochemistry occurs during visual perception analysis and interpretation of laboratory test for diagnosis and following of the disease.

CMO312 Theoretical Optometry 3(3-0-6)

Nature, theory, sign and symptom of vision and visual anomalies including refractive systems, binocular vision and ocular motility. Theory, distributions, prognosis and technics of visual assessment and management of refractive errors, binocular vision disorders and anomalies of ocular motility.

CMO313 Geometrical Optic 3(3-0-6)

The arithmetic, algebra, geometry, and trigonometry necessary to evaluate optical formulas. Geometrical optics: the basics of refraction at plane and spherical surfaces, image formation and magnification, spherical and sphero-cylindrical thin lenses, thin lens eye models, thick lenses, prisms,

reflection and mirrors. Physical Optics: conceptual and quantitative understanding of aberrations, characteristics of electromagnetic waves, diffraction, interference, fluorescence, polarization, scattering, photometry and other applications.

CMO314 Neurophysiology of Vision 2(2-0-4)

Mechanism of the visual system, perception of light; sensory processes involved in visual perception. spectral sensitivity, light and dark adaptation, temporal and spatial resolution, and principles of photometry. The monocular and binocular visual processes, physical space and visual space. Fundamental perceptual processes, binocular vision, stereopsis, binocular space perception. Systems of analysing binocular vision. Theory of aniseikonia. Perceptual aspects of aniseikonia. The color vision; Introduction to color vision and colorimetry. Laws of color mixture, chromaticity diagrams. Color matching and color discrimination. Characteristics of normal and defective color vision. The design and application of colorimeters, anomaloscopes, and colour vision screening tests.

CMO315 Vision Science 1: Monocular vision 2(2-0-4)

The functions of human eye associated with visual perception. It also includes the principals involved in seeing and the various factors affecting the visual process. Dioptrics of the eye, entoptic phenomena, pupil and its optical function, abnormal pupillary conditions, visual accommodation, retinal stimulation, visual sensation, characteristics of photopic vision and scotopic vision, nyctalopia.

CMO316 Vision Science 2: Binocular vision 2(2-0-4)

The functions of human eye associated with binocularly visual perception. The principals involved in seeing and the various factors affecting the visual process. Visual accommodation, visual sensation, mechanism & physiology of vision, Duplicity theory, fusion and vergence. Characteristics, control, and deficits of the somatic eye movement system, Strabismic, Pseudo-myopia, visual field and visual field defect.

CMO317 Ophthalmic Optics 3(3-0-6)

The theory behind spectacle lenses and frames, their materials, types, advantages and disadvantages, calculations involved, when and how to prescribe spectacle. It will impart construction, design, application and development of lenses, particularly the methods of calculating their power, effect and needs to manage customer in the optical set up, the physical and optical characteristics if ophthalmic single vision and multifocal lens design, ophthalmic prisms, absorptive lenses.

CMO318 Ocular Pharmacology 2(1-2-3)

Ocular pharmacology: Principles of ophthalmic pharmaceutical preparation and pharmacokinetics. Selection and use of all ophthalmic diagnostic pharmaceutical agents, palliative therapeutic agents (artificial tears, etc.) and ophthalmic therapeutic pharmaceutical agents. Side effects of the use of both ocular and systemic drugs, new pharmaceutical agents, and general pharmacology and toxicology.

CMO411 Epidemiology and Optometry in Community 3(2-2-5)

Introduction to epidemiology and public health, nature of the disease process, health problems and factors related to disease, disease prevention and control, public health service and administration, problem analysis, policy making, planning and assessment in community. Health policy and optometry profession, community optometric health problems, epidemiology of ocular anomalies, overview of public and community health planning and care, and the role of the optometrist in community health promotion. Patient's rights following national health service policy and social security fund.

CMO412 Socioeconomic and Business Aspects of Optometry 3(2-2-5)

The business and administrative sides of the practice of Optometry, process of management, including personnel administration, organization management, work analysis, evaluation of output, quality control, controlling process and using information technology for administration, the relation of optometry work and other public health work. Limitation of advertisement and propaganda in optometric practice in socioeconomic aspects.

2.2) Optometry professional subject

CMO221 Clinical Interview and History Taking in Optometry 2(1-2-3)

The basic principles of interviewing techniques, history taking about the general health and visual related health. Medical terminology for optometry. Interviewing techniques for special group of clients. Design of the further assessment. Differential Diagnosis from patient's record; visual related symptoms and non-visual related symptoms.

CMO321 Optometry Diagnosis Procedures 1: Refractive Anomalies 3(2-2-5)

Visual diagnosis, basic visual test and anomaly of refractive systems including myopia hyperopia astigmatism. Theoretical and the testing technique, process and method to access the refractive anomalies and presbyopia, the visual correction and treatment for anomalies.

CMO322 Ocular Diseases and Pathology 1: Anterior Segment 3(2-2-5)

Signs and symptoms, pathophysiology, epidemiology, clinical course, diagnosis procedures and differential diagnosis, initial management as well as medical, surgical and rehabilitative management concepts of ocular diseases of the anterior segment of the eye and ocular adnexa.

CMO323 Optometry Diagnosis Procedures 2: Binocular vision 4(2-4-6)

Diagnosis procedures following refractive anomalies, focusing in ocular motility and binocular vision, accommodative system of the eyes, fusion and suppression. Technics and method of diagnosis, criteria and treatment for binocular vision anomalies and refractive anomalies.

CMO324 Ocular Diseases and Pathology 2: Posterior Segment 3(2-2-5)

This second course covers signs and symptoms, pathophysiology, epidemiology, clinical course, diagnosis procedures and differential diagnosis, initial management as well as medical, surgical and rehabilitative management concepts of ocular diseases of the posterior segment of the eye; higher visual and oculomotor systems; congenital optic nerve disorders, and ocular oncology.

CMO325 Ophthalmic Dispensing 4(2-4-6)

Indication and method of lens types and material selection for different refractive power. Technology of lenses production, practicing lenses measurement, grinding and fitting, spectacle frame selection and prism use, to correct refractive and binocular vision anomalies.

CMO421 Introduction to optometry clinical practice 2(1-2-3)

Method of complete routine optometric examination by ophthalmological and optometrical equipments, in visual diagnosis and analysis. Theoretical and application of use in specialty tests. Case observation and case study for visual analysis diagnosis and basic treatment plans. Visual screening and refractive examination method for community eye-care.

CMO422 Neuro-Ophthalmic Diseases and Pathology 2(2-0-4)

A comprehensive review of common and compelling neuro-ophthalmic disorders encountered in clinical practice of optometry and ophthalmology. To provide ophthalmic practitioners with the appropriate knowledge and case examples of common neuro-ophthalmic disorders, appropriate training pursuant to the utilization of appropriate diagnostic studies to evaluate this group of patients such as neuroimaging (CT, MRI) , retino-choroidal angiography, echography, etc. , understanding of case management strategies related to neuro-ophthalmic disorders.

CMO423 Systemic Disease & Its Ocular Manifestation 2(2-0-4)

Consultation and care for patients who present with systemic illnesses, with or without ocular manifestations. Many of ocular disorders appear as a direct consequence of some systemic diseases. Moreover, treatment given for various eye conditions could have systemic side effects that should be recognized by optometrists. Provide students with basic understanding of the most common systemic diseases and their presentations, as well as their relationship to the abnormal ocular conditions.

CMO424 Optometry Clinic 1 3(1-4-4)

To foster progressive development of basic examination skills including, but not limited to, medical and ocular history, visual acuity, color vision, cover test, depth perception, pupillary and visual pathways, external ocular examination, retinoscopy and refraction, assessment of binocular vision and

ocular health. Construct working hypotheses, carry out appropriate examination procedures and gather data to diagnose and correct refractive anomalies of the human eye. Management of oculomotor abnormalities, basic spectacle prescription guidelines for myopia, hyperopia, and astigmatism

CMO431 Contact Lens 1 3(2-2-5)

Physico-chemical and mechanical properties of contact lens materials, optical and mathematical concepts. The theory of contact lens fitting, emphasis is on rigid and soft contact design and fitting concepts, clinical applications. Factors influencing lens selection and design, physiological response to contact lens wear, contra-indications for contact lens wear. Practicing basic patient evaluation and fitting procedures, recognize problems, and determine effective and appropriate solutions, ocular care and maintenance of contact lenses.44

CMO432 Visual Therapy 3(2-2-5)

Wide variety of non-surgical methods utilized to treat a number of neuromuscular, neurophysiological, and neurosensory conditions which interfere with visual function. This organized therapeutic regimen attempts to develop or improve visual skills and abilities; improve visual comfort, ease, and efficiency; and change visual processing or interpretation of visual information. Including; Orthoptic vision therapy – eye exercises to improve binocular function; Behavioral/perceptual vision therapy – eye exercises to improve visual processing and visual perception.

CMO433 Infants & Pediatric Optometry 3(2-2-5)

Human vision development, the diagnostic strategies for examining infants, toddlers, and preschoolers who are at risk for developing ocular, visual, and/or visual perceptual abnormalities. Clinical interaction with infant, toddler and pediatric patients. Discussion on how vision development guides treatment and management options in the pediatric population. Application of pediatric tests, the diagnosis and management of vision problems and pathology commonly affecting this population.

CMO434 Contact Lens 2 3(2-2-5)

Detection and management of chronic and acute complications induced by contact lenses. Advanced contact lens applications for special conditions such as dry eye, aphakia, high and irregular

astigmatism, keratoconus, presbyopia, post-surgical and irregular corneas, corneal reshaping, and ocular prosthetics. Disposable lenses and replacement regimens. Extended wear options. Alternative management of refractive errors such as orthokeratology and refractive surgery.

CMO435 Visual Perception and Learning Disability 2(2-0-4)

Visual information processing testing, organizing approach, uses to identify vision problems related to children with learning difficulty and special needs, including tests and measurements taken by optometrists. An overview of learning disabilities, the role of the optometrist in conjunction with the parents, teachers, and psychologists in assisting children, multidisciplinary approach in management of vision related learning problems. Sequential management plans for treating patients with special need.

CMO521 English for Clinical Practice in Optometry 1(1-0-2)

English for basic medical communications including Health history taking about ocular and health relating medical record and recent illness. The communication language relating different approach of visual tests. The communication skills necessary for health promotion patients care and health consultation.

CMO522 Optometry Clinic 2 6(0-12-6)

Advanced diagnostic and therapeutic procedures, providing an overview of disorders of the anterior and posterior segments of the eye. Develop the skills covered in the Optometric Clinic I, addition with the advance instruments, the use of diagnostic pharmaceutical agents. Additional diagnostic testing to determine appropriate testing procedures, analyze and formulate treatment plans. Spectacle prescription guidelines for senior and junior population.

CMO523 Legal Aspects and Professional Ethics in Optometry 1(1-0-2)

Knowledge of laws, ethics and professional laws in related to optometry. Regulations on license registration, licensing, Issuance of a substitute license and others. Professional faults and penalties. Ethics for sensitive patients. Clinical research ethics. Advertising controlled act. The standardized of service charge.

CMO524 Optometry Clinic 3 7(0-14-7)

Develops and enhances clinical diagnostic and treatment procedures taught in the previous courses, which will be emphasized together with fostering the student's ability to solve clinical problems through critical thinking, utilizing evidence-based medicine and scientific knowledge. To assess and verify the optometry student's level of competency in primary care optometry patient care skills. Students need to pass a comprehensive clinical skills proficiency examination to enter the externship programs in the final year.

CMO531 Geriatric Optometry 2(2-0-4)

The epidemiology of aging and the clinical effects of aging on the visual system. The optometric assessment and management of the aging patient. An introduction to low vision care with emphasis on assessment and management of visual impairment and disability, including optical and non-optical therapies. The epidemiology of vision impairment, multidisciplinary management, and associated rehabilitative services.

CMO532 Low Vision and Rehabilitation 2(1-2-3)

Fundamental knowledge of clinical low vision care and rehabilitation. Clinical examination techniques, optics lens and low vision devices, applications of low vision devices, low vision training, rehabilitative and psychosocial aspects of low vision care, and low vision treatment associated with specific disease processes. The psycho-social aspects that patients with low vision may experience in the community resources available for visually impaired individuals.

CMO533 Applied Ocular Therapeutics 2(1-2-3)

Application of orthoptic training to advance visual performance. The use of other therapeutic devices and methodologies for rehabilitation and management of visual and ocular related symptoms. Ocular hygienic, prosthetic eye, computer vision syndrome and headache. The nutrition for ocular health and vision and its application.

CMO541 Research Project 1 2(0-4-2)

Literature review on the student's area of interest, experimental design proposition, and preliminary data. Student and supervisor plan for the research topic of interest. Student creates a draft of proposal under the supervision of the supervisor. After approval, student presents his/her proposal at seminar sessions.

CMO542 Research Project 2 2(0-4-2)

Prerequisite: Have earned credits of CMO 541

An independent research project on an approved topic, supervised by faculty members. This is the completion of the research proposal in Research Project1. Preparing the complete study for presents his/her research at seminar sessions.

CMO651 Optometry Clinical Clerkship 1 14(0-42-0)

Prerequisite: Have earned credits of CMO524

The clinical clerkship in rotation system in the sixth year. Students will be rotated for various aspects of clinical practice, for example public hospitals, private hospitals, multidisciplinary practices, community health clinics, specialty care clinics, nursing homes, schools or in private practices, companies, and institutions related to ophthalmic business, following student’s need. These experiences provide students with a wide opportunity of patient care experiences. Conversion with clinical practice by providing patient care from beginning until completion under faculty supervision. Evaluation may involve oral examination, assessment of performance with patients, record review, and/or demonstration of techniques.

CMO652 Optometry Clinical Clerkship 2 14(0-42-0)

Prerequisite: Have earned credits of CMO524

The clinical clerkship in rotation system in the sixth year. Students will be rotated for various aspects of clinical practice, for example public hospitals, private hospitals, multidisciplinary practices, community health clinics, specialty care clinics, nursing homes, schools or in private practices, companies, and institutions related to ophthalmic business, following student’s need. These experiences provide students with a wide opportunity of patient care experiences. Conversion with

clinical practice by providing patient care from beginning until completion under faculty supervision. Evaluation may involve oral examination, assessment of performance with patients, record review, and/or demonstration of techniques. To prepare student into career after graduation.

3) Elective subjects

CMO481 Emergency detection and prehospital management 2(2-0-4)

Early detection and initial prehospital management for commonly encountered medical emergencies. Medical emergencies including: BLS and ACLS for sudden cardiac arrest patients, Cardiovascular emergencies: shock, chest pain, syncope, Severe hypertension, Respiratory emergencies: Dyspnea: pulmonary edema, anaphylaxis, asthma, hyperventilation, airway obstruction. Neurological emergencies: seizure disorders, Acute stroke, severe headache, Diabetic emergencies, Ocular emergencies, Assessment and management of these emergency situation, Safety referral-transfer patients. Assessment and management of these emergency situation, referral-transfer patients and CPR.

CMO581 Instruments and Technology in Optometry 3(2-2-5)

Advance ocular examining equipments and technique knowledge in optometric science. The recent invention of medical equipments and technologies for diagnosis and treatment of abnormal vision, practice and understanding the clinical guideline, interpretation of clinical test, advantage and disadvantage of the equipment. Optometric technologies, spectacles, contact lenses, intraocular lenses.

CMO582 Sport Vision and Occupational Optometry 2(2-0-4)

Theoretical part of vision in occupation and sport. Understanding the optometric guideline for visual screening and knowledging for occupational training and sport training in different kinds of workers and athletes for maximum visual performance and able to performing visual screening, diagnosis, primary care and proper refer.