



European Council of Optometry and Optics

The European Qualification in Optics

The Syllabus

October 2017

ECOO QUALIFICATION IN OPTICS

SYLLABUS

Subject 1 – Geometrical Optics

Suggested ECTS / ECVET: 6

Refraction at single spherical or plane surfaces

Curvature and sagittal

Refractive index and rectilinear propagation

Vergence and dioptric power

Object-image relationships, including apparent depth

Ray tracing, nodal point, and nodal ray

Lateral (translinear) and angular magnification

Snell's law of refraction

Thin Lenses

Vergence: dioptric and effective power

Object-image relationships

Lateral (translinear) and angular magnification

Thin lens systems

Prismatic effects (Prentice's rule and prism effectivity)

Ray tracing, optical centre and optic axis

Thick Lenses

Cardinal points

Vertex power and equivalent power

Lateral (translinear) and angular magnification

Reduced systems

Aberrations

Spherical

Gama

Oblique astigmatism

Curvature of field

Distortion

Chromatic (longitudinal and lateral

Higher order aberrations

Apertures

Entrance and exit pupil size and location

Depth of focus, depth of field, hyperfocal distance

Field of view and half illumination

Sphero-cylindrical lenses

Location of foci, image planes, principal meridians and circle of least confusion

Obliquely crossed sphero-cylindrical lenses

Transposition

Prismatic effect

Thin Prisms

Unit of measurement (prism dioptre)

Prism deviation

Combination of thin prisms

Resolution of an oblique prism into horizontal and vertical components

Total internal reflection

Mirrors

Planar and spherical reflection

Proportion of light reflected from a surface (Fresnel's law)

Focal power, focal length and curvature

Object image relationships

Magnification

Lens/mirror systems

Ray tracing

Ophthalmic and optical instruments

Direct and indirect ophthalmoscopes

Retinoscope

Focimeter

Biomicroscope (slit lamp microscope)

Radiuscope (microspherometer)

Keratometer (ophthalmometer)

Diagnostic lenses (gonioscope, fundus etc)

Wavefront technology

Subject 2 – Physical Optics

Suggested ECTS / ECVET: 4

Wave optics

Characteristics of wave motion

Classification of the electromagnetic spectrum

Total and partial coherence

Diffraction (single slit, circular aperture, limits of resolution, zone plates)

Interference (double slit, multiple slits, thin film, antireflective coatings, holography)

Scattering (Rayleigh compared to Tyndall)

Dispersion

Interaction of light and matter

Atomic energy levels, absorption and emission line spectra

Continuous spectra

Fluorescence (photons, energy levels)

Lasers (theory of operation, speckle pattern)

Spectral transmission

Light emitting diodes (LED)

Polarisation

Linearly polarised light

Circular and elliptical polarisation

Polarisation by reflection (glare reduction, Brewster's law)

Effects of scattering on polarisation

Transmission through successive polarisers (stress analysis, Malus' law)

Image Quality

Resolving power

Point and line spread function

Modulation transfer function (Fourier optics)

Subject 3 – Visual Optics

Suggested ECTS / ECVET: 2

Schematic eye models

Dioptric components

Cardinal points, entrance and exit pupils

Ametropia: far point, near point, correction

Accommodation: amplitude and effectivity

Astigmatism including correction

Retinal image size, spectacle magnification and relative spectacle magnification

Dioptrics of the eye

Characteristics of components (curvature, thickness, separation, refractive indices and axial length)

Reference angles and axes

Catoptric (Purkinje) images

Retinal image size

Optical function of the pupil

Quality of the retinal image

Aberrations (spherical, chromatic, coma, curvature, oblique astigmatism, distortion)

Diffraction

Stray light

Point and line spread functions

Radiation and the eye

Radiometry (radiant, intensity, radiance and irradiance)

Photometry (luminosity function, luminous intensity, luminance, illuminance, Lambertian surfaces-cosine laws)

Spectral transmission of the ocular media

Retinal illuminance

Effects of radiation (especially infrared, visible and ultraviolet)

Subject 4 Optical Appliances

Suggested ECTS / ECVET: 12

Physical characteristics of ophthalmic lenses

Geometry of lens surfaces (spherical, cylindrical, toric, aspheric)

Lens form

Lens thickness (centre, edge, gradients)

Specification of lens size and shape

Materials (refractive index, dispersion, hardness, specific gravity)

Optical characteristics of ophthalmic lenses

Locations of and relationships between the optic axis, optical centre, geometric centre and major reference points

Principles of corrected curve lens design

Verification of lens prescriptions (focimeter, lens measure)

Writing and transposing lens prescriptions

Effect of lens tilt (spheres and spherocylinders about a principal meridian)

Effective power (for near and for changes in vertex distances)

Ophthalmic prisms and prismatic effect of lenses

Thickness differences across a prism

Prismatic effects in the periphery of a lens (spheres, spherocylinders)

Decentration (prism from decentration, decentring to obtain prism, interpupillary distance)

Correction of vertical prism effect

- Slab off (front, back, top, bottom, reverse)

- Double slab off

- Dissimilar segments

- Compensated R segments

- Prism segments

- Multiple corrections

- Fresnel prisms

- Fresnel power additions

Multifocal lenses

Types (fused, one-piece, progressive power additions and blended lenses)

Methods of producing add powers

Segment centre location

Image movement

Total displacement, horizontal and vertical imbalance

Placement of distance and multifocal optical centre

Optical and physical characteristics of segments (design and calculations, progressive adds aberrations, surface characteristics)

Specifying multifocal height, size, shape and location of segment

Physical characteristics and biological compatibility of frame materials

Specification and nomenclature of spectacle frame components

Optical and spectacle frame consideration of high-powered lenses: spherical, aspheric and high index materials

Spectacle magnification

Shape and power factors

Iseikonic lens design

Methods of remedying reflections and secondary images

Absorptive lenses

Specification of lens tints and absorptive coatings (including spectral transmission curves)

Characteristics of photochromic lenses

Relationship between lens thickness and spectral transmission

Special occupational requirements

Impact Resistance

Degrees of resistance of ophthalmic lens materials

Methods of rendering materials impact resistance

Methods of verifying impact resistance

Performance of materials upon impact and after impact

Specification of occupational safety lenses

Optical tolerances and physical requirements of ophthalmic lenses and frame materials (EN)

Spectacle Applications

Spectacle lens prescriptions for ametropia

Lens problems of aberrations, weight, thickness, limits of field, secondary images, magnification, jump and displacement

Frame and lens design, including types of single vision and multifocal lenses, types of lens materials, base curves and cylinder forms, character and placement of multifocals, optical centres and frame specifications.

Evaluation of lenses and frames, via focimeter, lens gauge, observation, for optical centre positioning, powers and other specifications of design.

Fitting and adjusting frames for the wearer

Client counselling information associated with the dispensing of prescriptions for different ametropias.

Subject 5 – Occupational Optics

Suggested ECTS / ECVET: 2

Visual Performance

Visual capability

Visability of tasks

Ocular Injuries

Mechanical

Non-mechanical

Eye Protection

Lens materials

Testing procedures

Frame material

Regulations

Lamps and lighting

Concepts

Photometric units

Light sources

Luminaires

Lighting Design

Recommendations

Glare and its control

Visual display units

Asthenopia

Facial rash/dermatitis

Epilepsy

Radiation

Regulations

Driving

Visual function and driving performance

Visual demands

Regulations

Section 6 – Methods of Ocular Examinations

Suggested ECVET 3

Auto-refraction

Principles of auto-refraction

Effectiveness and limitations of auto-refraction

Accuracy of use

Visual Field Screening

Principles of visual field screening

Visual field defects and their causes

Benefits and limitations of visual field screening

Accuracy of use

Non contact tonometry

Principles of tonometry

Alternative methods of measuring intra ocular pressure

Advantages and disadvantages of non contact tonometry

The need for intra ocular pressure measurement

Accuracy of use

Fundus photography and ocular coherence tomography (OCT)

Principles of fundus photography and OCT

Advantages and disadvantages of fundus camera and OCT

Accuracy of use

Conditions for which OCT could be beneficial

Slit lamp

Principles of the slit lamp

Uses of the slit lamp

Section 7 – Refractive error

Suggested ECVET 4

Anatomical structures of the eye and their function

Refractive errors

Myopia

Hyperopia

Astigmatism

Presbyopia

Correction of refractive error

Spectacle lenses

Contact lenses

Laser surgery

Interpretation of optical prescriptions

Single vision prescriptions

Bifocal prescriptions

Progressive power prescriptions

Section 8 – Contact Lenses

Suggested ECVET 4

Professional and legal implications of the supply of contact lenses and aftercare

Medical devices directive

Legal requirements/qualifications to fit contact lenses

After care

Supply of contact lenses

Contact lens solutions

Medical devices directive

Different solutions for different types of contact lenses

Supply of solutions

Design of contact lenses

Specifications for the fitting of different types of contact lenses

Contact lens materials and advantages and disadvantages

Comparison of different designs, advantages and disadvantages

Medical use of contact lenses

Wearing modalities

Different wearing modalities their advantages and disadvantages

Replacement schemes for different materials

Non-compliance with wearing and care regimes

Limits of responsibility and authority of non-professional staff

Signs of non-compliance

Consequences of non-compliance

Storage and lens care within the practice

Lens care regimes for different modalities

Insertion and removal of different lens types

Section 9 – Ocular conditions and emergencies

Suggested ECVET 4

Eye Conditions encountered in an optical practice

Signs and symptoms of common red eye conditions

Aetiology of common red eye conditions

Management of red eye conditions

Flashes and floaters
Sudden loss of vision
Macula degeneration
Diabetic retinopathy
Strabismus
Amblyopia

Dealing with an ocular emergency

What is an ocular emergency?
Priorities in ocular emergencies
Communication with clients and relatives in ocular emergencies
Referral procedures
Role of non professional staff

Section 10 – Business management

Suggested ECVET 10

Legal and regulatory requirements

Trade descriptions in the optical environment
Employment law
Equal opportunities
Discrimination law
Data protection
Medical devices legislation

Health and Safety

Health and safety regulations applying to an optical practice
Client safety in the practice
Risk assessment
Fire equipment and regulations

Managing staff and performance development

Responsibilities of staff management

Staff development

Performance management

Appraisal systems

Disciplinary and grievance systems

Customer Service

Principles of customer service

Customer service in an optical environment

Managing complaints and complaint resolution

Managing customer behaviour in difficult situations

Selling in an optical environment

General rules of selling

Challenges in selling

Sales in an optical practice

Factors for success of an optical practice

Demographics

Location

Range of services

Financial planning

Advertising and Promotion

Understanding and evaluating the effectiveness of different marketing techniques

National and professional advertising regulations

Marketing communications and data protection

The role of promotions

Financial management

Price structures (cost price, mark ups, selling price, VAT, overheads, recovery of costs, profit margin)

Stock control

Different payment systems

Basic accounting

Subject 12 Communication

Communication in optical practice

Different communication styles and methods

Advantages and disadvantages of different communication methods

Addressing concerns of customer and family

Understanding limitations of responsibility

Client confidentiality

Record keeping

Recall systems

Subject 13 Professional Conduct

Regulatory and professional requirements

Regulations controlling eye care and the supply of spectacles and contact lenses

Responsibilities to clients

Legal obligations for optical practice

Quality assurance

Practice standards

The role of different eye care professionals