

N0010 LIGHTING ENGINEERING AND DESIGN

The School of Engineering (TAFE) RMIT has established a *non-award* program that covers the knowledge and skills in Lighting Engineering and Design. This program aims to provide participants with a coherent framework of established lighting engineering principles, techniques and practices; a phenomenological understanding of lighting discipline and recognisable level of current knowledge.

This is a two year part-time program which consists of 3 courses (subjects) with a total of 200 nominal contact hours per year. You will have to attend classes one day per week from 5.30 pm to 9.30 pm (see details below). Currently this program is not available online or in distance education mode.

Successful graduates are eligible for membership in the Illumination Engineering Society - Australia & New Zealand (<http://www.iesanz.org>). Please direct membership enquiries to either Mr Trevor Stork on 0408 508 854 or Mr Ian Johnson on 0412 042 989.

Enrolments

Australian and New Zealand residents should send their expression of interest to Matthew Brown - matthew.brown@rmit.edu.au - by email indicating their contact details: **name, home address, phone / mobile No., and email address**. You will be notified of enrolment dates and time via email and/or phone. If you have any further enquiries please contact Matthew Brown on (03) 9925 4262 or email above.

Fees

2009 tuition fees are **\$1,050 per year**.

Program content and timetable:

1st Year , Monday evenings 5:30- 9:30 ,Corner Queensberry and Lygon Street, Carlton, Level 2, room 57.02.006

EEET 6024L	Lighting Principles 1	60 Hours
EEET 6025L	Lighting Principles 2	60 Hours
EEET 6226L	Engineering Project.....	80 Hours

2nd Year Wednesday evenings 5:30- 9:30 ,Corner Queensberry and Lygon Street, Carlton, Level 2, room 57.02.006

EEET 6026L	Lighting Design 1	60 Hours
EEET 6027L	Lighting Design 2.....	60 Hours
EEET 6224L	Electrical Design	80 Hours

EEET 6024L LIGHTING PRINCIPLES 1

Course Aim: To provide the knowledge and skills necessary to utilise lighting codes and standards to produce simple internal lighting designs for buildings.

Theoretical knowledge acquisition and practical design processes achieve this objective.

Content:

Light Production

- Light production from early light sources
- Modern Lamps and Technology
- Thermo luminescent sources and others
- Tungsten as a radiator
- Black body radiators
- Life and efficiency
- GLS and Tungsten Halogen lamps
- Electrical discharge and fluorescent lamps
- Ionisation, excitation energy levels
- Voltage current characteristics/current limit
- Lamp colour and colour rendering
- Spectral distribution and colour temperature

Units and Concepts

- Human eye spectral response under photopic, mezopic and scotopic conditions.
- Definition of Units of:
 - Radiant Flux, Luminous Flux
 - Luminous intensity
 - Luminance and Illuminance
 - Inverse square law
 - Cosine law
 - Intensity verses angle (rectangular and polar Co-ordinates)
 - CIE terminology related definitions and units
 - Luminous efficacy, lumens per watt
 - CIE Standard observer, V_λ curves, Zonal factors

Electric Lamps

- Incandescent, (including tungsten halogen),
- Fluorescent, high and low-pressure discharge lamps
- Laser, LED and other miscellaneous lamp types
- Colour appearance/rendering of lamps

Lighting Economics

- Installation costs
- Running costs:
 - Maintenance
 - Energy
- Depreciation

Calculation of Illuminance

- Point by Point Method
- Lumen method of lighting design
- Room index
- Reflection Co-efficient
- Utilisation Factor
- Light Loss Factor
- Alternative methods of lighting design

Luminaries Construction

- Types (eg. interior/exterior etc)
- Use of various materials
- Use of reflectors/refractors/diffusers

Interior Lighting

- Analysis of requirements
- Visual Task Analysis
- Systems of lighting, Task and Ambient Lighting
- Discomfort glare, contributing factors
- Elementary study of office, commercial, industrial and outdoor lighting installations



EEET 6025L LIGHTING PRINCIPLES 2

Course Aim: This course covers the basic construction details of common types of luminaires. The learners are then introduced to thermal, electrical and International Protection (IP) testing requirements. The third element of this course covers characteristics of various lamp types and their application.

Content:

Luminaire Design

(suggested time 15 hours)

- Principles of reflector design
- Types of reflectors
- Dichroic filters
- Refractors
- Polarisation

Testing of Luminaries

(suggested time 10 hours)

- Thermal
- Electrical
- Radio frequency interference (RFI)
- Harmonics
- International Protection (IP) classification

Lamp Characteristics

(suggested time 15 hours)

- Incandescent
- Fluorescent
- Discharge
- High pressure sodium
- Mercury vapour
- Metal halide
- Other
- Cold cathode
- LED
- Xenon
- Laser
- Electroluminescent



EEET 6226L ENGINEERING PROJECT - LIGHTING

Course Aim: To enable students to proceed from a client's brief to the preparation of design and development concepts, engineering solutions, design and detail drawings, written reports of tasks, processes and design outcomes, and the oral presentation of technical information.

It is anticipated that this specially adapted project will address all the students' major study areas in the Lighting Design Program.

Content:

Given the range of project topics likely to be identified, the following is a list of key project-related tasks:

- Engineering project specifications
- Client interaction (interpersonal skills)
- Assessment of client need
- Report writing
- Preliminary design sketches
- Preliminary design calculations
- General arrangement drawing
- Lighting design – luminaire selection and placement. Detailed drawings showing layouts, switching and general arrangement, and mounting positions.

- Final report - to contain client brief of requirements and specifications, all drawings, design calculations and any special/novel design problems and/or solutions, a written report.

This course will provide students with the opportunity to demonstrate an integration of knowledge and skills acquired through earlier study and work experience. It is an opportunity to explore design concepts, and final submission documentation for tendering purposes.



EEET 6026L LIGHTING DESIGN 1

Course Aim: To provide the learner with the knowledge and skills to determine the objectives of a lighting design as well as final design calculations, both manual and computer-aided.

Content:

Design of Lighting

(suggested time 14 hours)

- Visual task analysis
- Preliminary design
- Detailed design
- Australian standards

Computer Techniques in Lighting

(suggested time 12 hours)

- Photometric data formats IES/CIE
- Calculation techniques - minimum, average
- Parameters required / physical input data
- Various interior design programs
- Various exterior design programs
- 3D rendering and simulation

Calculation techniques

(suggested time 14 hours)

Interior Lighting

- Lumen Method
- Zonel cavity calculation
- Indirect lighting calculations
- Linear source calculations
- Designed appearance/apparent brightness techniques

Exterior Lighting

- Lumen Method
- Point to point
- Zonel flux method



EEET 6027L LIGHTING DESIGN 2

Course Aim: This course provides the learner with the knowledge and understanding of a range of applied topics, including daylighting, public lighting and energy management.

Content:



Daylighting

(Suggested time 12 hours)

- What is daylight? - How it varies on a daily and seasonal basis - associated artificial skies
- Advantages and disadvantages of daylight with reference to:
 - illumination contribution
 - potential energy savings
 - glare factors
 - psychological and physiology considerations
- Principles and basic calculations – shadow angles and sunlight penetration, daylight factors
- Other measurement techniques (PASALI and BRS Protractors)

Applications

(Suggested time 9 hours)

- Emergency lighting
- Sports lighting
- Lighting for transportation
- Security lighting
- Spill and obtrusive lighting
- Other specialised applications
- Building services co-ordination

Energy Management

(Suggested time 10 hours)

- Daylight linking
- Hardware
- Energy efficient light sources
- Control gear
- System cost evaluation
- Life cycle costing

Public Lighting

(Suggested time 9 hours)

- Road and Pedestrian Lighting requirements
- Road reflection characteristics
- Cut-off and non cut-off luminaires
- Road lighting design (Category 'V')
- Choice of light source
- Methods of switching
- Lighting design for pedestrian and public places (Category 'P')

EEET 6224L ELECTRICAL DESIGN - LIGHTING

Course Aim: This course provides the learner with the knowledge and understanding of the quality aspects of lighting, relative to the basic lighting industrial practices in design process.

Content:



Architectural Considerations

- Exploration of background considerations
- Human needs which generate spaces
- The range of space types
- Uses or functions of spaces (ie. the activities of the occupants)
- Intangible factors relating to special quality
- Human psychology of reaction to spaces
- Sensory inputs, upper and lower limits
- Normal visual cues
- Other cues, hearing, movement, etc.
- Illusions and ambiguity
- Spatial perception by recognition and learning
- Aspects of designed space
- Arrangement of spatial elements
- Definition of some common 2-D and 3-D elements
- Principles of the design process
- Integration of lighting and architectural design

Quality of Light

- Brightness distribution
- Unwanted reflections
- Vector / Scalar ratios
- Contrast rendition factor
- Discomfort glare
- Methods of glare assessment
- Visual appraisal of particular installations

Creative Lighting Techniques

- Introduction to definitions and terminology
- Interiors
- Exterior structures / grounds
- Streetscapes
- Nightclubs
- Theatre
- Useable properties of light - definition, opportunities, examples
- Basic stage lighting - design, angles, terminology
- Light modifiers
- Colour and diffusion
- Gobo projection
- Control systems
- Lenses - types
- Applied stage lighting design principles
- Motorised and special effect lighting
- Design of basic dance floor lighting
- Decorative lighting - types, terminology
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