ELECTRICAL ENGINEERING DEPARTMENT
JADAVPUR UNIVERSITY

SYLLABUS OF M.E. ILLUMINATION ENGINEERING
[NEWLY ADOPTED FROM 2008-2009]

First Semester

Category - Departmental / Specialization Basket

Paper- I
PG / IlluE / T / 111A   Advanced Photometry
Radiometric and photometric standards, Chioce of right detector-detector specification-construction detail of luminance, illuminance meter. Construction and working principles of spectroradiometer, spectrophotometer and colorimeter. Retroreflection & its application.
Photometric measurement procedure-preparation of test report. Spectral power distribution data – assessment of lamp efficacy.
Colorimetry-Different colour specification systems and their limitations. Measurement of CRI, CRI of radiation due to multiple sources. Pigment colour and mixing of pigments in paint industries.

Paper- II
PG / IlluE / T/ 112A   Lighting Design & Calculation
Review of fundamentals of Illumination Engineering. Lighting field of luminaire-Practical coordinate systems, Transformation of coordinate system from point, line area source, Illuminance calculation- Derivation of luminous flux from luminous intensity, flux transfer and inter-reflection luminance calculations, Discomfort glare. Optical design-reflector system, refractor system. Principal of lighting design- Indoor lighting design by lumen method, by point method, Designing problem and solution and designing documentation. Exterior lighting system- Road lighting system and highway lighting system.

Paper- III
PG / IlluE / T/ 113A   Optical Radiation and Health
Optical Radiation:- UV, Visible, IR. Sources of UV radiation, sources of IR. Effects of human- eye, skin, vitamin-D and calcium metabolism, Biological rhythm, shift work and lighting photo therapy, jetlag and lighting. Effects on Microorganism- germicidal UV radiation. Insect response - Decoy lamp and Insect trap. Effect on poultry - Egg production, chicken growth and development. Effect on plant- plant response, plant lighting, green house and growth room photoperiod lighting, maximum lighting and terrarium lighting.

Paper- IV
From the interdisciplinary basket of **Electronics & Telecommunication Engg.** or **Energy Science.**

Paper- V
From the interdisciplinary basket of **Energy Science** or **Electrical Engg.**

Paper- VI
From the interdisciplinary basket of **Electronics & Telecommunication Engg.**, **Nano-Science and Material Engineering.**

Category – Sessional Courses

Sessional – I
PG /IlluE/ S / 111   Laboratory
Sessional – II
PG / IlluE /S / 112   Seminar

Second Semester

Category - Departmental / Specialization Basket
Paper – VII
PG /   IlluE / T/ 127A   Computer Aided Lighting System Design
Luminaires – types & performance, effects of luminaire photometry, specifying and using luminaire, optical design of luminaire, construction, software design of luminaire optics.
Advanced interior lighting design calculations, apparent brightness, cubic illuminance, illumination solid, CSP(Comfort, Satisfaction, Performance) index, software design on interior lighting.
Conventions for road lighting installation geometry, calculation of road surface luminance, calculation of TI(Threshold increment), glare control mark, measure of visibility, tabular & graphical methods, isoluminance diagram and templates, software design on road lighting.
Use of flood lighting diagrams, illuminance in complex situation, floodlighting of playgrounds, buildings and statues, analysis of the lighting parameters, optimisation of lighting parameters, simulation of visual environment with different lighting fittings, software design on flood lighting.
Software tools in lighting design.

Paper – VIII
PG /   IlluE / T/ 128A   Lighting Power Conditioning, Monitoring and Control
Lighting control strategies, techniques & equipment, sensors and timers, switches versus dimming control algorithm, harmonics, EI from lighting equipment – its measurement & suppression techniques.
Impact of lighting control, protocols for lighting control; Lighting control by computer, simple multi-channel & large multi-channel control, stage & entertainment lighting control, architectural & building lighting control systems; Centralised vs. distributed system; Status monitoring, fault monitoring, electrical load monitoring, lamp life monitoring system, applications.

Paper – IX
PG /   IlluE / T/ 129A   Daylighting Design and Analysis
The daylight and sunlight resource. Day-lighting concepts- designing side-lighting concepts, designing top-lighting concepts-designing atria, light courts and sun control – planning for daylight. Daylight availability data,
Daylighting analysis- lumen input method, daylight factor method, flux transfer method, physical scale model study.
Lighting integration-daylighting / electric lighting integration.

PG / IlluE / T/ 129B   Analysis of Lamps and Luminaires

Interaction of radiation with matter, Photopic and Scotopic vision of human eye, Incandescent lamp-its development, construction and characteristics, Filament design, Tungsten halogen lamp-its development, construction and characteristics. Discharge lamp-its development, construction, characteristics and application, Detailed study on mercury vapour, sodium vapour, metal halide, neon, sulphar, xenon and induction lamp.

Fiber optic lighting system-principle of operation, components, accessories and application. Laser and its application in lighting. LED and its application in lighting. Electroluminescent panel and its application.

Lamp testing procedures.

Light field, Optical control methods, Advanced techniques of using reflection, refraction, polarization, interference, diffraction, diffusion and absorption in optical control. Materials used for luminaire manufacturing.

Different Methods of Design of reflecting type and refracting type luminaires. Mechanical, thermal and electrical design of luminaire. Luminaire photometry, Luminaire testing procedures.

Paper – X

PG / IlluE / T/ 1210A   Illumination Audit and Management

Fundamentals of energy management, Fundamentals of lighting survey and audit, Energy management in illumination, Harmonics, Power quality, Demand side management (DSM), Lighting evaluation process and achieving energy efficiency, Techniques of collecting building information, Design and use of software of lighting survey and analysis.

Alternately, from the interdisciplinary basket of **Energy Science**.

<u>Category – Sessional Courses</u>

Sessional – I
PG /ILLUE/ S / 121<u>Term Paper Leading to Thesis</u>

Sessional – II
PG /ILLUE/S / 122 <u>Seminar</u>

<u>Third and Fourth Semester</u>

<u>Category – Sessional Courses</u>

Sessional 1

PG /IlluE/ TH / 21   <u>Thesis Work</u>

Sessional 2

PG /IlluE/ VV/ 22   <u>Viva – Voce</u>

Marks Distribution:

First Semester

Theory –   600 [6 Papers @ 100 marks]

Sessional – 100 [Laboratory-100; *Seminar Marks-100 to be added in 2nd Semester* **]**

Total – 700

Second Semester

Theory –   400 [4 Papers @ 100 marks]

Sessional – 300 [Seminar Marks-200 and Term paper – 100]

Total – 700

Third and Fourth Semester

Project Thesis – 300

Viva Voce –   100

Total - 400