

## **Abstract**

Outdoor lighting luminaires play an important role in lighting the night time environment. Adequate lighting on the streets serve and work as the identity of a city. Recently municipalities in India and throughout the world, are replacing the conventional street lights with LED street lights in order to improve lighting quality energy saving and other purposes.

Installation of new road lighting systems or retrofitting of the existing ones would require careful consideration of the design configurations that would maintain road surface average illuminance, uniformity and other parameters in accordance with regional, national, or international standards and guidelines. Moreover, a framework for LED luminaire power rating selection for retrofitting operations has been proposed to assist manufacturers, electrical contractors and utility operators entrusted with such work.

Integrating LED Street light with embedded system and communication module will add more functionality to the streetlight that has multiple advantages like monitoring the luminaire health status remotely, reduces maintenance and operational costs, provides better visual performance, provides automatic detection of pedestrian and finally serves citizens intelligently.

A detail design and development of intelligent street lighting luminaire and controller prototype has been done and described. Various properties have been implemented and integrated in this work like remote monitoring of the health and other parameters of the luminaire using wireless communication protocols and operated using a Smart Phone as a Hand Held Device (HHD). Suitable light control logic has been implemented and Pulse Width Modulation (PWM) approach has been incorporated in the system to modulate the light outputs of Warm White LED (WWLED) and Cool White LED (CWLED) arrays.

Light output, Illuminance values, Correlated Color Temperature (CCT), Color Rendering Index (CRI) Spectral power of the developed luminaire have been varied wirelessly. Performance parameters of the developed luminaire have been presented and analysed. Machine learning technique has been used to train and analyze various statistical parameters. The developed luminaires have been mounted on street lighting poles for photometric, electrical and environmental parameters measurement, recording and performance analysis at outdoor environment.