

BUILDING SERVICES II

ENEE 356

Lecture : 2
Tutorial : 0
Practical : 3/2

Year : III
Part : II

Course Objectives:

The objective of the course is to introduce students with fundamentals of electrical systems used in buildings and it enables students to integrate electrical and lighting design effectively into residential, commercial and industrial building planning and design.

- 1 Fundamental Electrical Concepts (6 hours)**
 - 1.1 Basic principles: Electricity, voltage, current, resistance, power, energy
 - 1.2 Ohm's and Kirchhoff's laws; Open, Close and short circuits
 - 1.3 Single-phase and three-phase AC circuits
 - 1.4 Electrical power generation and distribution: LT and HT supply, conductors, distribution systems
 - 1.5 Electrical distribution systems, transformers and service panels (MDB, SDB)

- 2 Safety and Protection in Electrical Systems (7 hours)**
 - 2.1 Electrical safety in buildings
 - 2.2 Protection devices: Fuses, MCB, MCCB, ACB, RCB (Operation, construction and applications)
 - 2.3 Earthing for electrical equipment and appliances
 - 2.4 Earthing methods and importance for safety
 - 2.5 Lightning protection systems and building safety

- 3 Lighting Systems and Design (9 hours)**
 - 3.1 Fundamentals of illumination, terminology and laws of illumination
 - 3.2 Lighting terminology: Lumen, lux, efficacy, color temperature, CRI, glare
 - 3.3 Types of lamps: Incandescent, fluorescent, CFL, LED (Emphasis on LED and energy-efficient systems)
 - 3.4 Types of luminaires: Recessed, surface-mounted, pendant, indirect, track, spotlight
 - 3.5 Lighting schemes: Direct, indirect, semi-direct, diffuse
 - 3.6 Lighting design considerations for residential, commercial, industrial and public spaces
 - 3.7 Methods of lighting calculation
 - 3.8 Special applications: Factory lighting, street lighting, flood lighting

4 Electrical Installation

(8 hours)

- 4.1 Types of wiring systems (Conduit, surface wiring and trunking)
- 4.2 Wiring materials and accessories (Wires, cables, switches, sockets)
- 4.3 General rules for wiring and code of practice
- 4.4 Load calculation: Determination of light and power sub-circuits, conductor sizing
- 4.5 Preparation of single-line diagrams and layout drawings
- 4.6 Electrical installation for HVAC systems, lifts, escalators and pumps

Practical

(22.5 hours)

1. Wiring accessories and protective devices: Hands-on study of materials like wires, cables, switches, sockets, distribution boards, fuses and MCBs to understand their construction and function
2. Market study and product specification: Conduct a market survey to collect brochures and specifications on available electrical lamps, appliances and equipment, understanding product variety and technical data
3. Preparation of electrical layouts: Detailed electrical layouts (Light and power circuit layouts, single-line diagrams) for a commercial or industrial building, applying the knowledge gained from the course
4. Integrated design application: Apply the practical and theoretical knowledge to prepare a detailed electrical design for a studio project

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapter	Hours	Mark distribution*
1	6	6
2	7	6
3	9	9
4	8	9
Total	30	30

* There may be minor deviation in marks distribution.

References

1. Gupta, J. B. (2013). A course in electrical installation estimating & costing. S. K. Kataria & Sons.
2. Raina, K. B., Bhattacharya, S. K. (2017). Electrical design, estimating & costing. New Age International Publishers.
3. Dubey, G. K. (2009). Fundamentals of electrical engineering. New Age International Publishers.
4. Szokolay, S. V. (2008). The architecture of light: Architectural lighting design concepts. Conceptnine.