

Course code	Course Name	L-T-P - Credits	Year of Introduction
EE405	Electrical System Design	3-1-0-4	2016
<b>Prerequisite: Nil</b>			
<b>Course Objectives</b> <ul style="list-style-type: none"> <li>To make aware of the Acts and Rules regulating the design of electrical systems in India.</li> <li>To impart knowledge in the design of low voltage and medium voltage electrical installations.</li> <li>To give basic knowledge of design of distribution transformer substations, their installations and earthing design for transformer substations</li> <li>To familiarise lighting calculations and external lighting.</li> </ul>			
<b>Syllabus</b> Electrical system design practices – general awareness of IS Codes, Electricity Acts & Rules, NEC etc. Domestic Installations, Industrial Installations and 11 kV substations. Design features of Recreational buildings and High-rise building. Selection of Standby generators and their Installations. Underground cable installations and their accessories. Design features of external lighting, lightning protection and special requirements for lifts and fire fighting equipments.			
<b>Expected outcome</b> The students will be able to <ol style="list-style-type: none"> <li>Know the basic Rules and Regulations of electrical systems design.</li> <li>Design simple electrical systems and prepare the schematic diagram with all the specifications.</li> </ol>			
<b>Text Books</b> <ol style="list-style-type: none"> <li>J. B. Gupta, A Course in Electrical Installation Estimating and Costing, S.K. Kataria &amp; Sons; Reprint 2013 edition (2013).</li> <li>K. B. Raina, S. K. Bhattacharya, Electrical Design Estimating Costing, NEW AGE; Reprint edition (2010).</li> <li>M. K. Giridharan, Electrical Systems Design, I K International Publishers, New Delhi, 2nd edition, 2016</li> </ol>			
<b>Data Book (Approved for use in the examination):</b> <ol style="list-style-type: none"> <li>M K Giridharan, Electrical Systems Design Data Hand book, I K International Publishers, New Delhi, 2011</li> <li>N. Rajendran, Electrical System Design Data Book</li> </ol>			
<b>References:</b> <ol style="list-style-type: none"> <li>National Electric Code, Bureau of Indian Standards publications, 2011.</li> <li>Relevant Indian Standard – specifications (IS – 732, IS – 746, IS – 3043, IS – 900), etc.</li> <li>S. L. Uppal, Electrical Wiring Estimating &amp; Costing, Khanna Publishers, 2008</li> </ol>			
<b>Course Plan</b>			
Module	Contents	Hours	Sem. Exam Marks
I	General awareness of IS Codes (IS 3043, IS 732, IS 2675, IS 5216-P12, IS 2309), The Indian Electricity Act 2003, National Electric Code (NEC 2011) - scope and safety aspects applicable to low and medium (domestic) voltage installations, Electric services in buildings, Classification of voltages, standards and specifications.	8	15%

<b>II</b>	General aspects of the design of electrical installations for domestic dwellings as per NEC guidelines (low and medium voltage installations)–connected load calculation, sub circuit determination, selection of main distribution board, sub distribution board, MCB, ELCB, MCCB and cables for sub circuits. Pre-commissioning tests of domestic installations.	10	15%
<b>FIRST INTERNAL EXAMINATION</b>			
<b>III</b>	Industrial installations –classifications- Design of distribution systems with light power and motor loads for small and medium industries. Selection of transformer substations, switchgears and protective devices – Design of indoor and outdoor 11 kV substations up to 630 kVA.	10	15%
<b>IV</b>	Short circuit calculations and Design of earthing for 11 kV substation of capacity up to 630 kVA. Pre-commissioning tests of cables and transformers.	8	15%
<b>SECOND INTERNAL EXAMINATION</b>			
<b>V</b>	Design of illumination systems – Average lumen method- lighting design calculations using Coefficient of utilisation (CU) and light loss factor (LLF) - classification and selection of luminaires. Exterior lighting design- road lighting and area lighting. Design requirements for high rise buildings and recreational buildings.	8	20%
<b>VI</b>	Energy conservation techniques in lighting and power. Selection of standby generator –power rating - Continuous, prime power and standby power, installation and its protection, Introduction to Automatic Main Failure (AMF) System. Introduction to Solar PV systems for domestic applications. Simple design projects.	10	20%
<b>END SEMESTER EXAMINATION</b>			

### QUESTION PAPER PATTERN (End semester exam)

Maximum Marks: 100

Exam Duration: 3 Hours.

**(Approved data handbook to be permitted inside examination hall)**

**Part A:** Eight compulsory questions. One question from each module of Modules I - IV; and two each from Module V & VI. Student has to answer all questions.  $(8 \times 5) = 40$

**Part B:** Three questions uniformly covering Modules I & II. Student has to answer any 2 from the 3 questions:  $(2 \times 10) = 20$ . Each question can have maximum of 4 sub questions (a, b, c, d), if needed.

**Part C:** Three questions uniformly covering Modules III & IV. Student has to answer any 2 from the 3 questions:  $(2 \times 10) = 20$ . Each question can have maximum of 4 sub questions (a, b, c, d), if needed.

**Part D:** Three questions uniformly covering Modules V & VI. Student has to answer any 2 from the 3 questions:  $(2 \times 10) = 20$ . Each question can have maximum of 4 sub questions (a, b, c, d), if needed.