

Ref No:

< Sri Krishna Institute of Technology, Bangalore >



COURSE PLAN

Academic Year 2019

Program:	B E – Electrical and Electronics Engineering
Semester :	5
Course Code:	17EE553
CourseTitle:	Estimation and Costing
Credit / L-T-P:	3/ 3-0-0
Total Contact Hours:	40
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Academic Evaluation and Monitoring Cell

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Note : Remove "Table of Content" before including in CP Book
Each Course Plan shall be printed and made into a book with cover page
Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

17EE553 : Electrical estimation and costing

A. COURSE INFORMATION1. Course Overview

Degree:	BE	Program:	EE
Year / Semester :	5	Academic Year:	2019-20
Course Title:	Electrical estimation and costing	Course Code:	17EE553
Credit / L-T-P:	3/6-2-0	SEE Duration:	180 Minutes
Total Contact Hours:	40	SEE Marks:	60 Marks
CIA Marks:	40	Assignment	1/Module
Course Plan Author:	Shweta B	Sign	Dt:
Checked By:		Sign	Dt:

2. Course Content

Module	Module Content	Teaching Hours	Module Concepts	Blooms Level
1	Principles of Estimation: Introduction to Estimation and Costing, Electrical Schedule, Catalogues Recording of Estimates, Labor Conditions, Purchase System, Purchase Enquiry and Selection of Appropriate Purchase Mode, Purchase Orders, Payment Of Bills, Tender Form, General Idea about IE Rule, Indian Electricity(IE) Act and IE Rules -29,30,45,46,47,50,51,54,55,77 and79 Determination of Required Quantity of Material, Determination of Cost Material and labor, Contingencies, Overhead Charges, Profit, Market Survey and Source Selection, Comparative Statement	8	1. Assessment of material quantities 2. surveying	L4
2	Wiring: Introduction, Distribution of energy in a Building, Desirabilities of Wiring. Multi Strand Cables, Voltage Grading and Specification of Cables Main Switch and Distribution Board, Conduits and its accessories and Fittings. Lighting Accessories and Fittings, Types of Fuses, Earthing Conductor. PVC Casing and Capping, Conduit Wiring, Types of cables used in Internal Wiring, Internal Wiring: General rules for wiring, Design of Lighting Points (Refer to Seventh Chapter of the Textbook), Number of Points, Main Switch and Distribution Board and Size of Conductor. Current Density, Layout.	8	1. Distribution of Energy 2.lighting points	L4
3	Service Mains: Introduction, Types, Estimation of Underground and Overhead Service Connections. Design and Estimation of Power Circuits: Introduction, Important Considerations Regarding Motor Installation Wiring, Input Power, Input Current to Motors, Rating of Cables, Rating of Fuse, Size of Condit, Distribution Board Main Switch and Starter.	8	1.service connection 2.power circuits	L3
4	Estimation of Overhead Transmission and Distribution Lines: , Dead End Clamps, Positioning of Conductors and Attachment to Insulators, Jumpers, Tee-Offs, Earthing of Transmission Lines, Guarding of Overhead Lines, Clearances of Conductor From Ground, Spacing Between Conductors, Important Specifications, Estimation problems, Repairing and Jointing of Conductors.	8	1. Power lines 2.Erection	L4
5	Estimation of Substations: Main Electrical connection, Graphical Symbols for Various Types of Apparatus andCircuit Elements on Substation main Connection Diagram, equipment for Substation, Substation Auxiliaries Supply, Substation earthing, Single Line Diagram of Typical Substations.	8	1.Substation elements 2.single line diagram	L3

3. Course Material

Module	Details	Available
1	Text books	
	A course in Electrical installation estimation and costing- J B Guptha	In Lib, In dept
2	Reference books	
a	Electrical estimation, Management and economics- P M Chandrashekharaiiah	In Lib, In dept
b	Electrical wiring and estimation- Raghavendra rao	In Lib
	Electrical estimation and costing- Gangadhar Rao	
3	Others (Web, Video, Simulation, Notes etc.)	
	Prepared notes, Video	Available

4. Course Prerequisites

SNo	Course Code	Course Name	Module / Topic / Description	Sem	Remarks	Blooms Level
1		Basic electrical and electronics	wiring	1		L3
2		Dc machines	motors	3		L3

Note: If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.

B. OBE PARAMETERS

1. Course Outcomes

Module #	COs	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level
17EE553.1	Understanding the purpose of estimation and costing	05	Assessment of material quantities	Lecture	Assignment and seminar CIA	L2 Understand
17EE553.2	Analysis of market survey	05	Surveying	Lecture	Assignment and seminar CIA	L4 Analyze
17EE553.3	List the methods of wiring and cables	04	Methods	Lecture PPT	Assignment and seminar	L2 Understand
17EE553.4	Explain the design of lighting points and circuits	08	Lighting points	Lecture / PPT	Assignment	L3 Apply
17EE553.5	Develop the estimation of underground and overhead service mains	04	Service mains	Lecture	CIA	L3 Apply
17EE553.6	Analysis of design and estimation of motor installation	06	Power circuits	ecture and Tutorial	Assignment and CIA	L4 Analyze
17EE553.7	Analyze the estimation of overhead transmission and distribution lines	06	Power lines	Lecture PPT	Assignment and CIA	L4 Analyze
17EE553.8	Examine the erection, repairing and jointing of power lines	06	Repair	Lecture	Assignment and CIA	L4 Analyze
17EE553.9	List out the substation symbols and electrical connections	06	Symbols	Lecture PPT	Assignment and CIA	L2 Understand
17EE553.10	Analysis of single line diagram, equipments of substation	06	Single line diagram	Lecture PPT	Assignment and	L4 Analyze

					CIA	
-	Total	56	-	-	-	-

Note: Identify a max of 2 Concepts per Module. Write 1 CO per concept.

2. Course Applications

SNo	Application Area	CO	Level
1	Management of time and reduction of wastage of material in estimation	CO1	L3
2	Understanding market rates and comparing rates of materials	CO2	L4
3	Selection of methods of wiring and cables	CO3	L2
4	Determine lighting points and number of circuits	CO4	L3
5	Selection of service mains	CO5	L3
6	Determination of required rated inputs to the motor installation	CO6	L4
7	Erection of transmission and distribution lines	CO7	L4
8	Cable jointing and repairing	CO8	L4
9	Understanding symbols required in substation installation	CO9	L2
10	Analysis of single line diagram of substation	CO10	L4

Note: Write 1 or 2 applications per CO.

3. Articulation Matrix

(CO – PO MAPPING)

module #	Course Outcomes COs	Program Outcomes												Level		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12			
17EE553.1	Understanding the purpose of estimation and costing	x														L2
17EE553.2	Analysis of market survey	x	x													L2
17EE553.3	List the methods of wiring and cables	x	x													L2
17EE553.4	Explain the design of lighting points and circuits	x	x	x	x	x										L3
17EE553.5	Develop the estimation of underground and overhead service mains	x	x	x	x	x				x						L2
17EE553.6	Analysis of design and estimation of motor installation	x	x	x						x						L2
17EE553.7	Analyze the estimation of overhead transmission and distribution lines	x	x	x												L3
17EE553.8	Examine the erection, repairing and jointing of power lines				x					x						L2
17EE553.9	List out the substation symbols and electrical connections	x														L2
17EE553.10	Analysis of single line diagram, equipments of substation				x					x						L2

Note: Mention the mapping strength as 1, 2, or 3

4. Mapping Justification

Mapping		Justification	Mapping Level
CO	PO		L2
CO1	PO1	Understanding the basic fundamentals of estimation and costing	L2
CO2	PO1	Understanding the procedure of survey	L2
CO2	PO2	Analysing the market survey	L2
CO3	PO1	Understanding the types of cable and methods	L2
CO3	PO2	Usage of suitable cable for particular current rating	L2
CO4	PO1	Understanding the method of wiring for different case with standards	L3
CO4	PO2	Analysis of wiring	L3
CO4	PO3	Designing suitable wiring connection for different case	L3
CO4	PO4	Finding the solution for complex wiring connections	L3

CO4	PO5	Finding the cost effective method of wiring modern technique	L3
CO5	PO1	Knowledge of OV and UG transmission cables	L2
CO5	PO2	Analysing the method for transmission cable laying area	L2
CO5	PO3	Devolpment of transmission system according to requirement	L2
CO5	PO4	Using the knowlwdege of OV ang UG transmission cable estimating and costing is done	L2
CO5	PO5	Selecting appropraite standard cable to resolve the complexity implementation	L2
CO5	PO8	Selecting and implementing appropriate method of service mains to maintain the beauty of city	L2
CO6	PO1	Understanding the basic fundamentals of motors and motor installation standards	L2
CO6	PO2	Analysing the complexity of installation of motors	L2
CO6	PO3	Design and estimating the motor installation pattern	L2
CO6	PO8	Devolpment of motor intallation wiring diagrams accoording to standards by maintaing precautinary measures	L2
CO7	PO1	Knowledge of over head transmission line and Distribution transmission line	L3
CO7	PO2	Analyze the estimation of overhead transmission and distribution lines	L3
CO7	PO3	Devolpment of overhead transmission and distribution lines	L3
CO8	PO4	Using the knowledge erection, repairing and jointing of power lines	L2
CO8	PO8	erecting, repairing and jointing of power lines using precautinary measures	L2
CO9	PO1	Basic knowledge of substaion components	L2
CO10	PO4	Analysing the complexity in single line diagram, equipments of substation by estimation	L2
CO10	PO8	Using the standards estimating the substaion and selection of apropraite site	L2

Note: Write justification for each CO-PO mapping.

5. Curricular Gap and Content

SNo	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping

Note: Write Gap topics from A.4 and add others also.

Understanding symbols required in substation installation

Analysis of single line diagram of substation

6. Content beyond Syllabus

S No	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping

Note: Anything not covered above is included here.

C. COURSE ASSESSMENT

1. Course Coverage

Module #	Title	Teaching Hours	No. of question in Exam						CO	Levels
			CIA-1	CIA-2	CIA-3	Asg	Extra Asg	SEE		
1	Principle of estimation	10	2	-	-	1	1	2	CO1, CO2	L2, L3, L4
2	Internal wiring	12	2	-	-	1	1	2	CO3, CO4	L2, L3
3	Service mains, Design and estimation of power circuits	10	-	2	-	1	1	2	CO5, CO6	L3, L4
4	Estimation of overhead transmission and distribution lines	12	-	2	-	1	1	2	CO7, CO8	L4
5	Estimation of substation	12	-	-	4	1	1	2	CO9, CO10	L2, L3, L4
-	Total	56	4	4	4	5	5	10	-	-

Note: Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

2. Continuous Internal Assessment (CIA)

Evaluation	Weightage in Marks	CO	Levels
CIA Exam – 1	15	CO1, CO2, CO3, CO4	L2, L3, L4, L2
CIA Exam – 2	15	CO5, CO6, CO7, CO8	L3, L4, L4, L4
CIA Exam – 3	15	CO9, CO10	L2, L3, L4
Assignment - 1	05	CO1, CO2, CO3, CO4	L2, L3, L4, L2
Assignment - 2	05	CO5, CO6, CO7, CO8	L3, L4, L4, L4
Assignment - 3	05	CO9, CO10	L2, L3, L4
Seminar - 1			
Seminar - 2			
Seminar - 3			
Other Activities – define – Slip test		CO1 to CO9	L2, L3, L4 ...
Final CIA Marks	20	-	-

Note : Blooms Level in last column shall match with A.2 above.

D1. TEACHING PLAN - 1

Module - 1

Title:	Divide and Conquer	Appr Time:	16 Hrs
a	Course Outcomes	-	Blooms Level
-	The student should be able to:	-	Level
1	Understand the purpose of estimation and costing	CO1	L2
2	Survey of market rates and material quantities	CO2	L3, L4
b	Course Schedule	-	-
Class No	Module Content Covered	CO	Level
1	Introduction to Subject, course objectives and outcomes	CO1	L2
2	Principles of Estimation: Introduction to Estimation and Costing,	CO1	L2
3	Electrical Schedule	CO1	L2
4	Catalogues, Recording of Estimates	CO1	L2
5	Labor Conditions, Purchase System	CO1	L2
6	Purchase Enquiry and Selection of Appropriate Purchase Mode,	CO1	L2
7	Purchase Orders	CO1	L2
8	Payment Of Bills	CO1	L2
9	Tender Form	CO1	L2

10	General Idea about IE Rule	CO1	L2
11	Indian Electricity(IE) Act and IE Rules -29,30,45,46,47,50,51,54,55,77 and79	CO1	L2
12	Determination of Required Quantity of Material	CO2	L3
13	Determination of Cost Material and labor	CO2	L3
14	Contingencies Charges	CO2	L2
15	Overhead Charges, Profit	CO2	L2
16	Market Survey and Source Selection	CO2	L4
17	Comparative Statement	CO2	L4
c	Application Areas	CO	Level
1	Management of time and reduction of wastage of material in estimation	CO1	L3
2	Understanding market rates and comparing rates of materials	CO2	L4
d	Review Questions	-	-
1	Define estimation?	CO1	L2
2	What is electrical schedule?	CO1	L2
3	How will you record estimation?	CO1	L2
4	What are skills estimator should have?	CO1	L2
5	List out the different types of purchase mode.	CO1	L2
6	What do you mean by contingencies charges?	CO2	L2
7	What are overhead charges?	CO2	L2
8	Define profit?	CO2	L2
9	What is market survey?	CO2	L4
e	Experiences	-	-
1		CO1	L2
2			
3			
4		CO3	L3
5			

Module – 2

Title:	Divide and Conquer	Appr Time:	10 Hrs
a	Course Outcomes	-	Blooms Level
-	The student should be able to:	-	
1	List the methods of wiring and cables	CO3	L2
2	Explain the design of lighting points and circuits	CO4	L3
b	Course Schedule	-	-
Class No	Module Content Covered	CO	Level
1	Wiring: Introduction	CO3	L2
2	Distribution of energy in a Building	CO3	L2
3	Desirabilities of Wiring	CO3	L2
4	Multi Strand Cables	CO3	L2
5	Voltage Grading and Specification of Cables, Main Switch and Distribution Board	CO3	L2
6	Conduits and its accessories and Fittings	CO3	L2
7	Lighting Accessories and Fittings	CO3	L2
8	Types of Fuses, Earthing Conductor	CO3	L2
9	PVC Casing and Capping, Conduit Wiring	CO3	L2
10	Types of cables used in Internal Wiring	CO4	L3
11	Internal Wiring: General rules for wiring	CO4	L3
12	Design of Lighting Points	CO4	L3
13	Number of Points	CO4	L3
14	Main Switch and Distribution Board and Size of Conductor. Current Density, Layout.	CO4	L3

c	Application Areas	CO	Level
1	Selection of methods of wiring and cables	CO3	L2
2	Determine lighting points and number of circuits	CO4	L2
			L2
d	Review Questions	-	L2
1	What is wiring?	CO3	L2
2	What are the desirabilities of wiring?	CO3	L2
3	What is Voltage Grading and Specification of Cables.	CO3	L2
4	How will you select Main Switch and Distribution Board?	CO3	L2
5	Mention conduit accessories.	CO3	L2
6	List the types of fuses.	CO3	L2
7	List out the types of cables.	CO3	L2
8	Mention few general rules for electrical wiring.	CO4	L3
9	How will you design lighting points?	CO4	L3
10	Discuss size of conductor and ratings of main switch and distribution board.	CO4	L3
e	Experiences	-	-
1		CO1	L2
2			
3			
4		CO3	L3
5			

E1. CIA EXAM – 1

a. Model Question Paper - 1

Crs Code:	17EE553	Sem:	5	Marks:	15	Time:	75 minutes	
Course:	Electrical Estimation and Costing							
-	-	Note: Answer any 3 questions, each carry equal marks.				Marks	CO	Level
1	a	Define estimation and state its purpose. State the important facts, which an estimator should know for preparing an internal wiring estimate.				5	CO1	L1
	b	How estimates are recorded? Why is it convenient to record estimates on loose sheets?				5	CO1	L2
	c	Explain different modes of tendering.				5	CO1	L3
		OR						
2	a	Draw and explain neat wiring diagram for a house installation showing connections for energy meter, main switch and distribution board.				6	CO3	L2
	b	Draw the electric circuit and estimate the quantity of material and total cost for PVC wiring system used in hall of 15m X 6m X 4.5m height. The hall is to be fitted with fan points and light points. Make your own assumptions for the number of fan and light points and other missing data's.				9	CO4	L3
3	a	Write short notes on a) Contingencies b) Guidelines for inviting tender c) purchase order				5	CO1	L1
	b	Explain the IE rules 29,30,45,46,47,50.				5	CO4	L2
	c	Explain comparative price statement.				5	CO2	L1
		OR						
4	a	What are the general rules to be followed for internal wiring.				5	CO4	L3
	b	b) The plan of a residential building which is to be provided with electric installation in PVC wiring system suitable for connection to an AC 1-phase, 240 V, 50 Hz supply. 2.(b).Company's meter will be located in the front Verandah. Draw the single line diagram for lighting and heating circuits on the sketch. Calculate i) Total load, Current, length of casing & cable, and size of cable. ii) Determine the quantity of materials for lighting. Assume i) Heating load 2500 Watts. ii) Height of ceiling as 3.6 metres.				10	CO4	L3

b. Assignment -1

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	17EE553	Sem:	5	Marks:	5 / 10	Time:	90 – 120 minutes
Course:	Electrical Estimation and Costing						
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							
SNo	USN	Assignment Description	Marks	CO	Level		
1	1KT15EE003	Define estimation and state its purpose.	5	CO1	L2		
2	1KT15EE003	Explain different modes of tendering.	5	CO1	L3		
3	1KT15EE006	State the important facts, which an estimator should know for preparing an internal wiring estimate.		CO3	L4		
4	1KT15EE006	How estimates are recorded? Why is it convenient to record estimates on loose sheets?	5	CO1	L2		
5	1KT15EE019	Draw and explain neat wiring diagram for a house installation showing connections for energy meter, main switch and distribution board.	5	CO4	L4		
6	1KT15EE019	Write short notes on a) Contingencies b) Guidelines for inviting tender	5	CO1	L2		
7	1KT16EE001	Write short notes on a)purchase order b) purchase objectives	5	CO1	L2		
8	1KT16EE001	Explain how is quantity of material required for internal wiring determined?	5	CO3	L4		
9	1KT16EE003	Explain by giving examples the following terms i) contingencies. ii) overhead charges iii) profit	5	CO1	L2		
10	1KT16EE003	What is meant by electrical schedule?	5	CO1	L2		
11	1KT16EE004	What is meant by global tendering, limited tendering and single tendering?	5	CO1	L2		
12	1KT16EE004	State the rules to be observed while inviting tenders.	5	CO1	L2		
13	1KT16EE005	Give the objectives, functions and setup of a organisation.	5	CO1	L2		
14	1KT16EE005	Draw and explain neat wiring diagram for a house installation showing connections for energy meter, main switch and distribution board.	5	CO4	L4		
15	1KT16EE006	Write short notes on a) Contingencies b) Guidelines for inviting tender c)purchase order	5	CO1	L2		
16	1KT16EE006	Explain the IE rules 29,30,45,46,47,50.	5	CO1	L2		
17	1KT16EE007	Explain comparative price statement.	5	CO2	L2		
18	1KT16EE007	What are the general rules to be followed for internal wiring.	5	CO3	L2		
19	1KT16EE008	How will you determine the number of circuits require in a house wiring installation?	5	CO3	L4		
20	1KT16EE008	Explain the IE rules ,45,46,47,50.	5	CO1	L2		
21	1KT16EE011	Explain estimation and costing.	5	CO1	L2		
22	1KT16EE011	Explain by giving examples the following terms i) purchase order ii) tender form iii) profit	5	CO1	L2		
23	1KT16EE013	Explain purchase enquiry and selection of appropriate purchase mode	5	CO1	L2		
24	1KT16EE013	Explain system of wiring.	5	CO3	L2		
25	1KT16EE014	Give the objectives, functions and setup of a organization.	5	CO1	L2		
26	1KT16EE014	Explain Guidelines for inviting tender.	5	CO1	L2		
27	1KT16EE016	What are the factors to be considered for choice of wiring system?	5	CO3	L2		
28	1KT16EE016	State the rules to be observed while inviting tenders.	5	CO1	L2		
29	1KT16EE017	What is meant by spot tendering, open tendering and proprietary tendering?	5	CO1	L2		
30	1KT16EE017	What are the advantages and disadvantages of conduit wiring?	5	CO3	L2		
31	1KT16EE018	State the important facts, which an estimator should know for preparing an internal wiring estimate.	5	CO3	L2		

32	1KT16EE018	Draw and explain neat wiring diagram for a house installation showing connections for energy meter, main switch and distribution board.	5	CO3	L2
33	1KT16EE019	Explain comparative price statement.	5	CO2	L4
34	1KT16EE019	What is meant by spot tendering, open tendering and proprietary tendering?	5	CO1	L2
35	1KT16EE020	What is meant by global tendering, limited tendering and single tendering?	5	CO1	L2
36	1KT16EE020	What are the advantages and disadvantages of cleat wiring?	5	CO3	L2
37	1KT16EE021	State the rules to be observed while inviting tenders.	5	CO3	L2
38	1KT16EE021	Give the objectives, functions and setup of a organization.	5	CO1	L2
39	1KT16EE023	Explain different system of wiring.	5	CO3	L2
40	1KT16EE023	Write short notes on Contingencies, Guidelines for inviting tender, purchase order	5	CO1	L2
41	1KT16EE025	What are the important points to be considered while determining the size of conductor for internal wiring?	5	CO3	L2
42	1KT16EE025	What are the advantages and disadvantages of PVC casing and capping wiring?	5	CO3	L2
43	1KT16EE026	Explain the different types of electrical wiring.	5	CO3	L2
44	1KT16EE026	Explain the positioning of wiring accessories in the house.	5	CO3	L2
45	1KT17EE401	Give the objectives, functions and setup of a organization.	5	CO2	L2
46	1KT17EE401	How will you determine the number of points ?	5	CO4	L4
47	1KT17EE403	Explain how is quantity of material required for internal wiring determined?	5	CO4	L4
48	1KT17EE403	What is meant by global tendering and single tendering?	5	CO1	L2

D2. TEACHING PLAN - 2

Module – 3

Title:	Divide and Conquer	Appr Time:	16 Hrs
a	Course Outcomes	-	Blooms Level
-	The student should be able to:	-	
1	Develop the estimation of underground and overhead service mains	CO5	L2
2	Analysis of design and estimation of motor installation	CO6	L4
b	Course Schedule		
Class No	Module Content Covered	CO	Level
1	Introduction to Subject, course objectives and outcomes	CO5	L2
2	Service Mains: Introduction	CO5	L2
3	Types, Estimation of Underground and Overhead Service Connections.	CO5	L2
4	Design and Estimation of Power Circuits: Introduction	CO6	L4
5	Important Considerations Regarding Motor Installation Wiring	CO6	L4
6	Input Power	CO6	L4
7	Input Current to Motors	CO6	L4
8	Rating of Cables	CO6	L4
9	Rating of Fuse	CO6	L4
10	Size of Condit	CO6	L4
11	Distribution Board Main Switch and Starter.	CO6	L4
c	Application Areas	CO	Level
1	Selection of service mains	CO5	L2
2	Determination of required rated inputs to the motor installation	CO6	L4
d	Review Questions		
1	List the types of service mains.	CO5	L2
2	What is underground service connection?	CO5	L2
3	What is overhead service connection?	CO5	L2

4	List out important considerations regarding motor installation.	CO6	L4
5	How will you determine the input power to a motor of given output and efficiency?	CO6	L4
6	How will you determine the input current to a motor?	CO6	L4
7	Why the conduit enclosing PVC cables are usually run on surface rather laying them in covered trenches?	CO6	L4
8	How the size of conduit for motor wiring is determined?	CO6	L4
9	How the rating of distribution board in motor installation is decided?	CO6	L4
10	How the current rating of main switch used in motor installation is determined?	CO6	L4
e	Experiences	-	-
1			
2			
3			
4			
5			

D3. TEACHING PLAN - 3

Module – 5

Title:	Divide and Conquer	Appr Time:	16 Hrs
a	Course Outcomes	-	Blooms Level
-	The student should be able to:	-	
1	List out the substation symbols and electrical connections	CO9	L2
2	Analysis of single line diagram, equipments of substation	CO10	L4
b	Course Schedule		
Class No	Module Content Covered	CO	Level
1	Introduction to Subject, course objectives and outcomes	CO9	L2
2	Estimation of Substations	CO9	L2
3	Main Electrical connection	CO9	L2
4	Graphical Symbols for Various Types of Apparatus and Circuit Elements on Substation main Connection Diagram	CO9	L2
5	equipment for Substation	CO9	L2
6	Substation Auxiliaries Supply	CO9	L2
7	Substation earthing	CO9	L2
8	Single Line Diagram of Typical Substations.	CO10	L4
c	Application Areas	CO	Level
1	Understanding symbols required in substation installation	CO10	L3
2	Analysis of single line diagram of substation	CO9	L4
d	Review Questions	-	-
1	State any four types of substations according to the service.	CO10	L1
2	State the relative merits of indoor and outdoor substations.	CO10	L3
3	What are the factors governing the selection of site for substation?	CO9	L2
4	List out the equipment used in a substation.	CO9	L4
5	What are the functions of panels and firefighting equipment in a substation?	CO10	L2
6	What is flexible bus?	CO9	L5
7	Name the inter lockings provided with isolators.	CO9	L2
8	In what way is in isolator different from an air-break switch?	CO9	L3
9	Give the sequence of operation during opening and closing of a circuit.	CO9	L4
10	Why are isolators necessarily provided on the supply side of the circuit breakers?	CO9	L1
11	What is meant by a substation?	CO10	L4

e	Experiences	-	-
1			L2
2			
3			
4		CO9	L3
5			

E3. CIA EXAM – 3

a. Model Question Paper - 3

Crs Code:	17EE553	Sem:	5	Marks:	15	Time:	75 minutes	
Course:	Electrical Estimation and Costing							
-	-	Note: Answer any 2 questions, each carry equal marks.				Marks	CO	Level
1	a	What is substation? What are the functions of a substation?				5	CO9	L2
	b	Estimate quantity of materials required for adding 132kv bay at 132 kv grid substation.				10	CO10	L3
OR								
2	a	write different types of substation. Explain briefly.				7	CO9	L2
	b	Estimate the quantity of material required for installation of 132/33 KV substation with main and transfer bus scheme having 2*40 MVA transformers.				8	CO10	L3
3	a	What are the factors considered for selection of the site for a substation and explain.				5	CO9	L2
		write the material required for 33/11 KV outdoor substation and draw key diagram with one input and 6 output lines.				10	CO10	L3
OR								
4	a	Give layout of an indoor substation and describe briefly the function of each component used.				7	CO9	L2
	b	Estimate the quantity of material required and cost of installation of 132/33kv substation with main and transfer bus scheme having 2 X 40 MVA transformers.				8	CO10	L3

b. Assignment – 3

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions								
Crs Code:	17EE553	Sem:	5	Marks:	5 / 10	Time:	90 – 120 minutes	
Course:	Electrical Estimation and Costing							
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.								
SNo	USN	Assignment Description				Marks	CO	Level
1	1KT15EE003	What are the functions of a substation? What are the different types of substations? Write short notes on each of them.				5	CO9	L2
2	1KT15EE003	Classify the substations according to the service and constructional features.				5	CO9	L3
3	1KT15EE006	Compare indoor and outdoor substations.					CO9	L2
4	1KT15EE006	Draw a single line diagram of a 220kv/66kv substation showing all the equipments. The station has one 220kv incoming line and two 66kv outgoing lines and two power transformers.				5	CO10	L3
5	1KT15EE019	List out the equipment used in a substation.				5	CO9	L2
6	1KT15EE019	What are the functions of panels and firefighting equipment in a substation?				5	CO9	L2
7	1KT16EE001	Name the inter lockings provided with isolators.				5	CO9	L2
8	1KT16EE001	Classify the substation on the basis of nature of duties.				5	CO9	L2
9	1KT16EE003	Compare indoor and outdoor substations.				5	CO9	L2
10	1KT16EE003	What is substation? What are the functions of a				5	CO9	L2

		substation?			
11	1KT16EE004	Estimate quantity of materials required for adding 132kv bay at 132 kv grid substation.	5	CO10	L3
12	1KT16EE004	Explain pole mounted substations.	5	CO9	L2
13	1KT16EE005	Give layout of an indoor substation and describe briefly the function of each component.	5	CO9	L2
14	1KT16EE005	Differentiate between the functions of an isolator and a circuit breaker.	5	CO9	L2
15	1KT16EE006	Make a list of the main component in a substation. Draw layout of a substation.	5	CO9	L2
16	1KT16EE006	What is necessity of substation in a power system?	5	CO9	L2
17	1KT16EE007	Estimate the quantity of material required for the augmentation of 33kv grid substation of 500kva to 1000kva, 33/11kv grid substation.	5	CO10	L3
18	1KT16EE007	Classify the substation on the basis of importance.	5	CO9	L2
19	1KT16EE008	Draw a single line diagram of a 220kv/66kv substation showing all the equipments. The station has one 220kv incoming line and two 66kv outgoing lines and two power transformers.	5	CO10	L3
20	1KT16EE008	write different types of substation. Explain briefly.	5	CO9	L2
21	1KT16EE011	Estimate the quantity of material required for installation of 132/33 KV substation with main and transfer bus scheme having 2*40 MVA transformers.	5	CO10	L3
22	1KT16EE011	What are the factors governing the selection of site for substation?	5	CO9	L2
23	1KT16EE013	List out the equipment used in a substation.	5	CO9	L2
24	1KT16EE013	What are the functions of panels and firefighting equipment in a substation?	5	CO9	L2
25	1KT16EE014	What is flexible bus?	5	CO9	L2
26	1KT16EE014	Name the inter lockings provided with isolators.	5	CO9	L2
27	1KT16EE016	In what way is in isolator different from an air-break switch?	5	CO9	L2
28	1KT16EE016	Give the sequence of operation during opening and closing of a circuit.	5	CO9	L2
29	1KT16EE017	Why are isolators necessarily provided on the supply side of the circuit breakers?	5	CO9	L2
30	1KT16EE017	What is meant by a substation?	5	CO9	L2
31	1KT16EE018	Classify the substation on the basis of nature of duties.	5	CO9	L2
32	1KT16EE018	List out the equipment used in a substation.	5	CO9	L2
33	1KT16EE019	What are the functions of panels and firefighting equipment in a substation?	5	CO9	L2
34	1KT16EE019	Name the inter lockings provided with isolators.	5	CO9	L2
35	1KT16EE020	Classify the substation on the basis of nature of duties.	5	CO9	L2
36	1KT16EE020	Estimate the quantity of material and cost for installation of 10MVA, 33/11KV substation.	5		L2
37	1KT16EE021	What are the factors considered for selection of the site for a substation and explain.	5	CO9	L2
38	1KT16EE021	write the material required for 33/11 KV outdoor substation and draw key diagram with one input and 6 output lines.	5	CO10	L3
39	1KT16EE023	Classify the substation on the basis of operating voltage.	5	CO9	L2
40	1KT16EE023	List out the equipment used in a substation.	5	CO9	L2
41	1KT16EE025	What are the functions of panels and firefighting equipment in a substation?	5	CO9	L2
42	1KT16EE025	Classify the substation on the basis of design.	5	CO9	L2
43	1KT16EE026	Classify the substation on the basis of nature of duties.	5	CO9	L2
44	1KT16EE026	Estimate the quantity of material and cost for installation of 10MVA, 33/11KV substation.	5	CO10	L3
45	1KT17EE401	State any four types of substations according to the service.	5	CO9	L2
46	1KT17EE401	State the relative merits of indoor and outdoor substations.	5	CO9	L2
47	1KT17EE403	Give layout of an indoor substation and describe briefly the function of each component used.	5	CO9	L2

48	1KT17EE403	Estimate the quantity of material required and cost of installation of 132/33kv substation with main and transfer bus scheme having 2 X 40 MVA transformers.	5	CO10	L3
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F. EXAM PREPARATION

1. University Model Question Paper

Course:	Electrical Estimation and Costing			Month / Year	May /2018		
Crs Code:	17EE553	Sem:	5	Marks:	100	Time:	180 minutes
-	Note	Answer all FIVE full questions. All questions carry equal marks.			Marks	CO	Level
1	a	what is the purpose of estimating and costing? State the important facts, which an estimator should know for preparing an internal wiring estimate.			6	CO1	
	b	Briefly explain the Purchase Functions and Purchase objectives.			5		
	c	Write short notes on a) catalogues b) market survey and source selection.			5	CO2	
		OR					
-	a	Define tender. Explain modes of tendering.			16 / 20	CO1	
	b	Write short notes on a) Contingencies b) Guidelines for inviting tender.				CO2	
	c	Explain the IE rules 29,30,45,46,47,50.					
2	a	What are the general rules to be followed for internal wiring.			16 / 20	CO3	
	b	The plan of a residential building which is to be provided with electric installation in PVC wiring system suitable for connection to an AC 1-phase, 240 V, 50 Hz supply is shown in fig 2.(b).Company's meter will be located in the front Verandah. Draw the single line diagram for lighting and heating circuits on the sketch. Calculate i) Total load, Current, length of casing & cable, and size of cable. ii) Determine the quantity of materials for lighting. Assume i) Heating load 2500 Watts. ii) Height of ceiling as 3.6 metres.					
		OR					
-	a	Explain the different types of wiring.			16 / 20	CO3	
	b	Write a short note on a)Fuse b) Cables				CO4	
	c	Fig Q2(b) shows the plan of residential building which has to be wire up with casing and capping wiring system calculate the following: (i) show the wiring plan (ii) propose load calculation (iii) find the length of wire for wiring (iv) list the materials and find total cost.					
3	a	what are the different types of service connection, list advantages and disadvantages?			16 / 20	CO5	
	b	Three ac, 3 phase, 415 V, 50 Hz squirrel cage motors are to be installed in a workshop. The rated outputs of the motors and their locations are shown in fig.5(b). Star-delta starters supplied with each motor are to be installed on the wall. 1. Make a neat sketch of the wiring scheme with the help of single line diagram indicating on the wiring diagram the number and size of cables used. Prepare also a list of material with full specifications. 2. Calculate Length of HG conduit pipe for each motor, length of PVC Cable required for each motor, total earth wire required. Assume motor efficiency 85% and power factor 0.8					
		OR					
-	a	List any 10 considerations regarding motor installation wiring.			16 / 20	CO5	
	b	Find the material required for 1-Phase overhead service line of a house located 10 meters away from pole with following loads: Light and fan load = 3000 Watts. (Assume missing data)					

4	a	write the main components of overhead lines.	16 / 20	CO7	
	b	Estimate the quantity of material required and cost of 1km of overhead 11kV 50 Hz line using steel pole of 11meter and ACSR conductor of 6/1*2.59 mm with an average span of 120m.			
		OR			
-	a	Estimate quantity of materials required for adding 132kv bay at 132 kv grid substation.	16 / 20	CO7	
	b	explain the testing and commissioning of over head distribution line.		CO8	
5	a	write different types of substation.	16 / 20	CO9	
	b	Estimate the quantity of material required for installation of 132/33 KV substation with main and transfer bus scheme having 2*40 MVA transformers.		CO1 0	
		OR			
	a	What are the factors considered for selection of the site for a substation and explain.	16 / 20	CO9	
	b	write the material required for 33/11 KV outdoor substation and draw key diagram with one input and 6 output lines.			

2. SEE Important Questions

Course:	Electrical Estimation and Costing				Month / Year	AUG /2018	
Crs Code:	17EE553	Sem:	5	Marks:	80	Time:	180 minutes
	Note	Answer all FIVE full questions. All questions carry equal marks.				-	-
Module	Qno.	Important Question			Marks	CO	Year
1	1	what is the purpose of estimating and costing? State the important facts, which an estimator should know for preparing an internal wiring estimate.			16 / 20	CO1	2017
	2	Briefly explain the Purchase Functions and Purchase objectives.				CO1	2017
	3	Write short notes on a) catalogues b) market survey and source selection.				CO2	2017
	4	Explain the IE rules 29,30,45,46,47,50.				CO1	2017
	5	Define tender. Explain modes of tendering.				CO1	2017
		Write short notes on a) Contingencies b) Guidelines for inviting tender.				CO1	2017
2	1	What are the general rules to be followed for internal wiring.			16 / 20	CO3	2017
	2	The plan of a residential building which is to be provided with electric installation in PVC wiring system suitable for connection to an AC 1-phase, 240 V, 50 Hz supply is shown in fig 2.(b).Company's meter will be located in the front Verandah. Draw the single line diagram for lighting and heating circuits on the sketch. Calculate i) Total load, Current, length of casing & cable, and size of cable. ii) Determine the quantity of materials for lighting. Assume i) Heating load 2500 Watts. ii) Height of ceiling as 3.6 metres.				CO4	2017
	3	Explain the different types of wiring.				CO3	2017
	4	Write a short note on a)Fuse b) Cables				CO3	2017
		The plan of residential building which has to be wire up with casing and capping wiring system calculate the following: (i) show the wiring plan (ii) propose load calculation (iii) find the length of wire for wiring (iv) list the materials and find total cost.				CO4	2017
3	1	what are the different types of service connection, list advantages and disadvantages?			16 / 20	CO3	2017
	2	Three ac, 3 phase, 415 V, 50 Hz squirrel cage motors are to be installed in a workshop. The rated outputs of the motors and their locations are shown in fig.5(b). Star-delta starters supplied with each motor are to be installed on the wall. 1. Make a neat sketch of the wiring scheme with the help of single line				CO6	2017

		diagram indicating on the wiring diagram the number and size of cables used. Prepare also a list of material with full specifications. 2. Calculate Length of HG conduit pipe for each motor, length of PVC Cable required for each motor, total earth wire required. Assume motor efficiency 85% and power factor 0.8			
	3	List any 10 considerations regarding motor installation wiring.		CO5	2017
	4	Find the material required for 1-Phase overhead service line of a house located 10 meters away from pole with following loads: Light and fan load = 3000 Watts. (Assume missing data)		CO6	2017
					2017
4	1	write the main components of overhead lines.	16 / 20	CO7	2017
	2	Estimate the quantity of material required and cost of 1km of overhead 11kV 50 Hz line using steel pole of 11meter and ACSR conductor of 6/1*2.59 mm with an average span of 120m.		CO8	2017
	3	Estimate quantity of materials required for adding 132kv bay at 132 kv grid substation.		CO8	2017
	4	explain the testing and commissioning of over head distribution line.		CO7	2017
					2017
5	1	write different types of substation.	16 / 20	CO9	2017
	2	Estimate the quantity of material required for installation of 132/33 KV substation with main and transfer bus scheme having 2*40 MVA transformers.		CO10	2017
	3	What are the factors considered for selection of the site for a substation and explain.		CO9	2017
	4	write the material required for 33/11 KV outdoor substation and draw key diagram with one input and 6 output lines.		CO10	2017

G. Content to Course Outcomes

1. TLPA Parameters

Table : TLPA – Example Course

Module-#	Course Content or Syllabus (Split module content into 2 parts which have similar concepts)	Content Teaching Hours	Blooms' Learning Levels for Content	Final Blooms' Level	Identified Action Verbs for Learning	Instruction Methods for Learning	Assessment Methods to Measure Learning
A	B	C	D	E	F	G	H
1	1 Principles of Estimation: Introduction to Estimation and Costing, Electrical Schedule, Catalogues Recording of Estimates, Labor Conditions, Purchase System, Purchase Enquiry and Selection of Appropriate Purchase Mode, Purchase Orders, Payment Of Bills, Tender Form,	3	- L1 - L2	L2	- Remembering - Explaining	- Lecture	-Unit Test - Assignment
1	General Idea about IE Rule, Indian Electricity(IE) Act and IE Rules -29,30,45,46,47,50,51,54,55,77 and79 Determination of Required Quantity of Material, Determination of Cost Material and labor, Contingencies, Overhead Charges, Profit, Market Survey and Source Selection, Comparative Statement	11	- L1 - L2	L2	- Remembering - Explaining	- Lecture	-Unit Test - Assignment
2	Wiring: Introduction, Distribution of energy in a Building, Desirabilities of	6	- L2 - L3	L3	- Understa	- Lecture	-Unit Test -

	Wiring. Multi Strand Cables, Voltage Grading and Specification of Cables Main Switch and Distribution Board, Conduits and its accessories and Fittings. Lighting Accessories and Fittings, Types of Fuses, Earthing Conductor. PVC Casing and Capping, Conduit Wiring,				nding - Calculate		Assignment
2	ypes of cables used in Internal Wiring, Internal Wiring: General rules for wiring, Design of Lighting Points (Refer to Seventh Chapter of the Textbook), Number of Points, Main Switch and Distribution Board and Size of Conductor. Current Density, Layout.	5	- L2 - L3	L3	- Understa nding - Calculate	- Lecture	-Unit Test - Assignment
3	3 Service Mains: Introduction, Types, Estimation of Underground and Overhead Service Connections. Design and Estimation of Power Circuits: Introduction, Important Considerations Regarding Motor Installation Wiring,	8	- L2 - L4	L4	- Understa nding - Explainin g & analyzi ng	- Lecture	-Unit Test - Assignment
3	Input Power, Input Current to Motors, Rating of Cables, Rating of Fuse, Size of Condit, Distribution Board Main Switch and Starter.	4	- L2 - L4	L4	- Understa nding - Explainin g & analyzi ng	- Lecture	-Unit Test - Assignment
4	Estimation of Overhead Transmission and Distribution Lines:, Dead End Clamps, Positioning of Conductors and Attachment to Insulators, Jumpers, Tee-Offs, Earthing of Transmission Lines,	4	- L1 - L2	L2	- Rememb ering - Explainin g	- Lecture	-Unit Test - Assignment
4	Guarding of Overhead Lines, Clearances of Conductor From Ground, Spacing Between Conductors, Important Specifications, Estimation problems, Repairing and Jointing of Conductors.	8	- L2 - L4	L4	- Understa nding - Explainin g	- Lecture	-Unit Test - Assignment
5	Estimation of Substations: Main Electrical connection, Graphical Symbols for Various Types of Apparatus and Circuit Elements on Substation main Connection Diagram	6	- L2 - L4	L4	- Understa nding - Explainin g	- Lecture	-Unit Test - Assignment
5	equipment for Substation, Substation Auxiliaries Supply, Substation	04	- L1 - L2	L2	- Rememb	- Lecture	-Unit Test -

earthing, Single Line Diagram of Typical Substations.				ering - Explaining	- -	Assignment
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2. Concepts and Outcomes:

Table : Concept to Outcome – Example Course

Module #	Learning or Outcome from study of the Content or Syllabus	Identified Concepts from Content	Final Concept	Concept Justification (What all Learning Happened from the study of Content / Syllabus. A short word for learning or outcome)	CO Components (1.Action Verb, 2.Knowledge, 3.Condition / Methodology, 4.Benchmark)	Course Outcome Student Should be able to ...
A	I	J	K	L	M	N
1	Principles of Estimation: Introduction to Estimation and Costing, Electrical Schedule,	Catalogues Recording of Estimates, Labor Conditions, Purchase System,	Tender Form, General Idea about IE Rule. Indian Electricity (IE) Act and IE Rules -29,30,45,46,47,50,51,54,55, 77 and 79	Determination of Required Quantity of Material,	Determination of Cost Material and labor,	Contingencies, Overhead Charges, Profit, Market Survey and Source Selection, Comparative Statement
2	Wiring: Introduction, Distribution of energy in a Building,	Desirabilities of Wiring. Multi Strand Cables, Voltage Grading and Specification of Cables Main Switch and Distribution Board,	Conduits and its accessories and Fittings. Lighting Accessories and Fittings, Types of Fuses, Earthing Conductor.	PVC Casing and Capping, Conduit Wiring, Types of cables used in Internal Wiring, Internal Wiring: General rules for wiring,	Design of Lighting Points (Refer to Seventh Chapter of the Textbook),	Number of Points, Main Switch and Distribution Board and Size of Conductor. Current Density, Layout.
3	Service Mains: Introduction, Types,	Estimation of Underground and Overhead Service Connections.	Performance of Transmission lines	Estimation of Underground and Overhead Service Connections.	Design and Estimation of Power Circuits: Introduction, Important Considerations Regarding Motor Installation Wiring, Input Power,	Input Current to Motors, Rating of Cables, Rating of Fuse, Size of Conduit, Distribution Board Main Switch and Starter.
4	Estimation of Overhead Transmission and Distribution	Dead End Clamps, Positioning of	Performance of Transmission lines	Earthing of Transmission Lines, Guarding of Overhead Lines,	-Clearances of Conductor From Ground, Spacing Between Conductors,	Important Specifications, Estimation problems, Repairing and Jointing of Conductors.

	Lines:	Conductors and Attachment to Insulators, Jumpers, Tee-Offs,				
5	Estimation of Substations: Main Electrical connection,	Graphical Symbols for Various Types of Apparatus	and Circuit Elements on Substation	main Connection Diagram, equipment for Substation,	Substation Auxiliaries Supply, Substation earthing,	Single Line Diagram of Typical Substations.