

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title	: COMPUTER AIDED ELECTRICAL DRAFTING	Course Code	: 15EE47P
Semester	: IV	Course Group	: Core
Teaching Scheme in Hrs (L:T:P)	: 0:2:4	Credits	: 3 Credits
Type of course	: Tutorial + Practical	Total Contact Hours	: 78
CIE	: 25 Marks	SEE	: 50 Marks

Pre-requisites : Engineering Drawing, Basic Computer Skills

Course Objectives : Prepare the student for design using Computer using CAD software.

Course Outcomes:

On successful completion of the course the student will be able to -

1. Understand CAD Application package for Electrical Drawing.
2. Develop winding diagrams of Electrical Machines.
3. Draw and Realise the Sectional views of AC Machines.
4. Understand and Draw Electrical Building Wiring, Panel board wiring, Single line diagrams.

Course Contents:

Staff-in-charge must teach one hour tutorial for each Lab. The Contents to be taught in the one hour tutorial are

Introduction to Computer Aided Drawing

Tutorial 1

3 Hrs

Software packages available, CAD software screen, Standard menus / toolbars, Navigational tools, Zoom, Pan, Co-ordinate systems, Selection of drawing size and scale, Co-ordinate points,

Performing Experiment 1

Familiarisation of CAD Software

Tutorial 2

6 Hrs

Draw commands - line, line type, circle, arc, rectangle, polygons, array, polyline, text, multitrace, explode, hatch, polygons, array, polyline, text, multitrace, explode, hatch

Performing Experiment 2

Practice the commands using CAD software. Create simple drawing using above commands.

Tutorial 3

6 Hrs

Editing commands - erase, copy, move, offset, mirror, rotate, trim, extend, break, chamfer, fillet, layer.

Performing Experiment 3

Practice the commands using CAD software.

Tutorial 4

3 Hrs

Dimensioning commands - linear dimensioning – horizontal, vertical, aligned, baseline, continuous, diameters, radii, chords, arc, angle. Leader, Arrow.

Performing Experiment 4

Practice the commands using CAD software.

WINDING DIAGRAMS

Tutorial 5

3 Hrs

DC armature winding – double layer progressive lap, winding table, sequence diagram.

Performing Experiment 5

Draw the developed winding diagram of 24 conductor 4 poles Double Layer progressive lap winding.

Printing/plotting

Tutorial 6

3 Hrs

Print/Plot – Printer selection, paper size selection, Selecting drawing portion to plot, scaling, setting horizontal and vertical alignment for plotting

Performing Experiment 6

Preparing paper layout and Plotting the drawings.

Tutorial 7

3 Hrs

DC armature winding – double layer progressive wave, winding table, sequence diagram.

Performing Experiment 7

Draw the developed winding diagram of 26 conductor 4 poles Double Layer progressive wave winding.

Tutorial 8

3 Hrs

3 Phase AC stator winding - AC full pitched lap winding.

Performing Experiment 8

Draw the developed winding diagram of 24 conductor 4poles 3ph AC full pitched lap winding.

Tutorial 9

3 Hrs

3PhaseAC stator winding - AC short pitched lap winding.

Performing Experiment 9

Draw the developed winding diagram of 24 conductor 4 poles 3 ph AC short pitched lap winding.

ASSEMBLY DIAGRAMS

Tutorial 10	6 Hrs
DC machine – Main pole and field coil assembly.	
Performing Experiment 10	
Draw the sectional end view and front view of main pole and field coil assembly of a dc machine.	
Tutorial 11	9 Hrs
DC machine - Yoke and pole assembly.	
Performing Experiment 11	
Draw the sectional end view and front view of yoke and pole assembly of a dc machine.	
Tutorial 12	9 Hrs
AC 3 phase alternator - Stator assembly.	
Performing Experiment 12	
Draw the sectional end view and front view of AC machine stator assembly.	
Tutorial 13	9 Hrs
AC induction motor - Squirrel cage rotor assembly.	
Performing Experiment 13	
Draw the sectional end view and front view of squirrel cage rotor assembly.	
Tutorial 14	6 Hrs
Transformer - Single phase core type transformer.	
Performing Experiment 14	
Draw the sectional and front view and plan of single phase core type transformer.	

FREE HAND SKETCH

Tutorial 15	3 Hrs
LT distribution panel board- construction, components, connections	
Performing Experiment 15	
Prepare LT Main Panel board General Arrangement diagram as per requirements.	
Tutorial 16	3 Hrs
Single line diagram – using standard symbols.	
Performing Experiment 14	
Draw single line diagram of 66kV/11kV substation.	

References:

1. Computer Aided Electrical Drawing
- YOGESH, NAGARAJA, NANDAN PHI Publication
2. Electrical Drafting - S.F. DEVALAPUR EEPB
3. Electrical Drawing - K.L. NARANG
4. Electrical Engineering Drawing – S. K. BHATTACHARYA
5. QCAD - An Introduction to Computer-Aided Design - By Andrew Mustun

e-Resources

1. http://www.faveodesign.co.uk/CAD_Drawings.html
2. http://cad.about.com/od/Learn_CAD/a/The-Fundamentals-Of-Drafting.htm
3. <http://transport.itu.edu.tr/PDF/iml332e/Fundamentals%20of%20CAD.pdf>

Composition of Educational Components:

Questions for CIE and SEE will be designed to evaluate the various educational components such as:

Sl. No.	Educational Component	Weightage (%)
1	Remembering	20
2	Understanding	20
3	Application/ Analysis	60
Total		100

Mapping Course Outcomes with Program Outcomes: (Course Outcome linkage to Cognitive Level)

Course Outcome		Experiment linked	PO Mapped	Cognitive Level	Lab Sessions
CO1	Understand CAD Application package for Electrical Drawing.	1,2,3,4,6	2, 3, 8, 9, 10	R/U/A	15
CO2	Develop winding diagrams of Electrical Machines.	5,7,8,9,	2, 3, 8, 9, 10	U/A	12
CO3	Draw and Realize the Sectional views of AC Machines.	10,11,12, 13,14	2, 3, 8, 9, 10	U/A	15
CO4	Understand and Draw Electrical Building Wiring, Panel board wiring, Single line diagrams.	15,16,	2, 3, 8, 9, 10	U/A	6

U-Understanding; A-Analysis; App-Application.

Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Computer Aided Electrical Drafting	-	3	3	-	-	-	-	3	3	3

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.

If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3

If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2

If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1

If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

Course Assessment and Evaluation:

Method	What		To Whom	Frequency	Max Marks Practical	Evidence Collected	Course Outcomes
Direct Assessment	CIE (Continuous Internal Evaluation)	I A Tests	Students	Practical: Two IA tests (Average of IA test marks will be computed)	10	Blue Books	1 to 4
		Record Writing		Record Writing (Average of Marks allotted for each expt.)	10	Lab Record	1 to 4
		Student Activity		Student Activity	5	Paper work and Printout	1 to 4
		TOTAL		25			
	SEE (Semester End Examination)	End Exam	Students	End Of the Course	50	Answer Scripts	ALL COs
Indirect Assessment	Student Feedback on course		Students	Middle Of The Course		Feed Back Forms	1, 2, 3,4
	End Of Course Survey			End Of The Course		Questionnaire	ALL COs

*CIE – Continuous Internal Evaluation

*SEE – Semester End Examination

Note:

- I.A. test shall be conducted as per SEE scheme of valuation. However obtained marks shall be reduced to 10 marks. Average marks of two tests shall be rounded off to the next higher digit.
- Rubrics to be devised appropriately by the concerned faculty to assess Student activities.

Suggested Student Activity:

Student has to perform any **ONE** activity from the list given below and submit self handwritten single line diagram collected from the place student visited and draw the same using CAD. Submit printout along with.

1. Visit nearby factory, get layout diagram of the shop floor. Draw the same using CAD.
2. Visit the nearby substation, get different single line diagram of substation. Draw the same using CAD.
3. Draw the single line diagram of polytechnic laboratory.
4. Draw single line diagram of panel board available in polytechnic/factory/substation
5. Draw the layout of machines in any laboratory.
6. Draw basic electrical & electronic components and circuits.

MODEL OF RUBRICS / CRITERIA FOR ASSESSING STUDENT ACTIVITY (Course Coordinator)

Dimension	Scale					Students score (Group of five students)				
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	1	2	3	4	5
1	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	3				
2	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2				
3	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	5				
4	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	4				
Note: Concerned faculty (Course coordinator) must devise appropriate rubrics/criteria for assessing Student activity for 5 marks One activity on any one CO (course outcome) may be given to a group of FIVE students Grand Average/Total						14/4				
						=3.5				
						≈4				

**Example only: MODEL OF RUBRICS / CRITERIA FOR ASSESSING STUDENT ACTIVITY-
Task given- Industrial visit and report writing**

Dimension	Scale					Students score (Five students)				
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	1	2	3	4	5
1. Organisation	Has not included relevant info	Has included few relevant info	Has included some relevant info	Has included many relevant info	Has included all relevant info needed	3				
2. Fulfill team's roles & duties	Does not perform any duties assigned	Performs very little duties	Performs partial duties	Performs nearly all duties	Performs all duties of assigned team roles	2				
3. Conclusion	Poor	Less Effective	Partially effective	Summarises but not exact.	Most Effective	5				
4. Conventions	Frequent Error	More Error	Some Error	Occasional Error	No Error	4				
Total marks						14/4=3.5 ≈4				

Scheme of Valuation:

Examination Duration - 04 Hrs

Sl. no.	Performance	Max. Marks
1.	Winding diagrams Calculation + developing winding diagram on monitor sequence diagram <p align="center">OR</p> Free Hand Sketch Any one exercise in detail + Index (legend)	5+15 = 20
2.	Assembly drawings Sectional end view and front elevation (Front elevation and plan in case of transformer)	15+10 = 25
3.	Two printouts	5
	TOTAL	50

Standard drawings are to be given for free hand sketch and assembly drawing.