14-12-2024 09:10:11 PM

COMPUTER AIDED DRAWING AND SIMULATION **Course Code : 314008**

Programme Name/s : **Electrical Engineering/ Electrical Power System**
Programme Code : **EE/ EP**
Semester : **Fourth**
Course Title : **COMPUTER AIDED DRAWING AND SIMULATION**
Course Code : **314008**

I. RATIONALE

It is the need of the industry to draw electrical engineering drawings and use CAD software effectively as per the requirement. In this course, students will practice to interpret drawings, communicate ideas, and turn concepts into practical designs. They gain skills in navigating CAD software and using its tools efficiently to draw electrical drawings. This course is designed in such a way that practical performed in this course will enhance their skills to compete in fast growing electrical industry and understand different circuits by simulation.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Draw electrical drawings using CAD and simulate basic Electrical circuits using simulation software(s).

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Comprehend Electrical Drawings.
- CO2 - Locate various components of CAD software.
- CO3 - Use relevant CAD Tools and Commands for Electrical Drawings.
- CO4 - Draw different Electrical Drawings using CAD software.
- CO5 - Simulate Basic Electrical and Electronic circuits.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
314008	COMPUTER AIDED DRAWING AND SIMULATION	CDS	SEC	-	-	4	-	4	2	-	-	-	-	-	25	10	25@	10	-	-	50

COMPUTER AIDED DRAWING AND SIMULATION **Course Code : 314008**

Total IKS Hrs for Sem. : 0 Hrs
Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination
Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Sketch the electrical symbols as per requirement in electrical drawings. TLO 1.2 Interpret given electrical power/control wiring diagram. TLO 1.3 Identify types of electrical panel. TLO 1.4 Sketch GA Diagram of Electrical control panel (Assume suitable dimensions).	**Unit - I Electrical Drawings.** 1.1 Symbols: Electrical and Electronic as per SP 30: 2023 Part 1, section 3. 1.2 Types of electrical drawings (a) Power wiring diagram (single line diagram (SLD) or Multiline diagram) (b) Control wiring diagram (Schematic diagram) (c) Block diagrams (d) Pictorial diagrams. 1.3 Types of Electrical panels (a) MCC (Motor control center) Panel (b) PCC (Power control center) panel (c) APFC (Automatic Power Factor Controller) Panel (d) PLC (Programmable logic controller) Panel. 1.4 General Arrangement (GA) diagram of Electrical control panel.	Hands-on Presentations Lecture Using Chalk-Board
2	TLO 2.1 Identify the function of the given components of CAD classic screen. TLO 2.2 Identify the given components of CAD screen. TLO 2.3 Identify the given toolbar and commands.	**Unit - II Computer Aided Design (CAD) Introduction.** 2.1 Components of CAD classic screen. 2.2 Menu bar and status bar. 2.3 Open and Save file. 2.4 CAD Toolbars. 2.5 Command Box. 2.6 Zoom in and Zoom out.	Hands-on Presentations Demonstration

COMPUTER AIDED DRAWING AND SIMULATION **Course Code : 314008**

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Use the coordinate methods and practice basic commands. TLO 3.2 Practice Draw, Modify and Annotation toolbar commands. TLO 3.3 Practice Important CAD Modes.	**Unit - III CAD Tools and Commands.** 3.1 Coordinate Method: Absolute, Relative, Polar. Basic commands: Limits, Units. 3.2 Draw Toolbar: Line, Polyline, Circle, Arc, Rectangle, Ellipse, Polygon, Hatch. 3.3 Modify Toolbar: Move, Rotate, Trim, Erase, Copy, Cut, Mirror, Fillet, Chamfer, Offset, Explode, Strech, Scale. 3.4 Annotation Toolbar: Multiline Text, Single Line Test, Linear dimension, Aligned dimension, Angular Dimension, Arc Length Dimension, Radius Dimension, Diameter Dimension 3.5 Important CAD Modes : Grid, Ortho, Snap, Polar Tracking, Object Snap Tracking.	Hands-on Demonstration Presentations
4	TLO 4.1 Sketch the power wiring diagram, control wiring diagram and GA Diagram of Electrical control panel using CAD TLO 4.2 Sketch the Single line diagram (SLD) of the 11 kV/433 V distribution substation using CAD TLO 4.3 Sketch the Single line diagram (SLD) of residential/commercial unit using CAD TLO 4.4 Sketch the Single line diagram (SLD) of any industrial plant using CAD	**Unit - IV Use of CAD in Real World Electrical Engineering Drawings.** 4.1 Applications of electrical CAD software to: (a)Draw power wiring diagram of electrical control panel. (b)Draw control wiring diagram of electrical control panel. (c)Draw GA diagram of electrical control panel. 4.2 Applications of electrical CAD software to Single line diagram (SLD) of the 11 kV/433 V distribution substation. 4.3 Prepare Single line diagram (SLD) of residential/commercial unit using CAD. 4.4 Draw the Single line diagram (SLD) of any industrial electrical installation using CAD.	Hands-on Demonstration Presentations
5	TLO 5.1 Select and use softwares for Electrical and electronic circuit simulations. TLO 5.2 Build, Simulate and Test Basic electric circuits. TLO 5.3 Build, Simulate and Test Basic electronic circuits. TLO 5.4 Measure various electrical parameters and Generate or plot relevant Waveforms/Graphs. TLO 5.5 Develop P.C.B. layout for a given electrical circuit using software.	**Unit - V Simulation of Electrical and Electronic Circuits.** 5.1 Voltage, current, power across (a)Series R-L circuit (b)Series R-C circuit (c)Series R-L-C circuit. 5.2 Rectifier circuit, KVL and KCL simulation. 5.3 Triac Lamp Dimmer Circuit simulation. 5.4 Basic Logic Gate and adder circuit simulation. 5.5 Printed Circuit Board (PCB) preparation basic information.	Hands-on Demonstration Presentations

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Draw symbols of different electrical and electronic components using drawing instruments.	1	*Symbols of Electrical and Electronic Components as per SP 30: 2011(NEC 2011) part 1, section 3 or new equivalent IS on sketch book.	2	CO1
LLO 2.1 Draw Power and control wiring diagram for DOL starter.	2	*Power and Control wiring diagram of DOL Starter on sketch book.	2	CO1

COMPUTER AIDED DRAWING AND SIMULATION **Course Code : 314008**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 3.1 Draw Power and control wiring diagram for Star Delta starter.	3	*Power and Control wiring diagram of Star Delta Starter on sketch book.	2	CO1
LLO 4.1 Draw General Arrangement (GA) Diagram for DOL/Star delta starter panel or any other electrical panel.	4	General Arrangement Diagram for Electrical Panel on sketch book (Assume suitable dimensions).	2	CO1
LLO 5.1 Install CAD software. LLO 5.2 Create new drawing. LLO 5.3 Locate components of CAD Classic Screen (CAD screen layout, Drawing area, Menu and Toolbars, Status bar).	5	*Different components of CAD classic screen.	2	CO2
LLO 6.1 Create and Save drawing. LLO 6.2 Set the drawing Limits and Units of the file. LLO 6.3 Perform Zoom in and Zoom out functionality.	6	*CAD file operations and Limits & Units of Drawing.	2	CO2
LLO 7.1 Use Draw Toolbar of CAD for drawing basic geometrical shapes.	7	* Basic geometrical shapes using Draw Toolbar commands (Line, Polyline, Circle, Arc, Rectangle, Ellipse, Polygon, Hatch).	2	CO2 CO3
LLO 8.1 Use Modify Toolbar of CAD for modifying or editing CAD drawing.	8	Modifying or editing basic geometrical shapes using modify commands (Move, Rotate, Trim, Erase, Copy, Cut, Mirror, Fillet, Chamfer, Offset, Explode, Stretch, Scale).	2	CO2 CO3
LLO 9.1 Use Annotation Toolbar of CAD for writing Text and measuring dimensions.	9	*Annotation Toolbar commands (Multiline Text, Single Line Test, Linear dimension, Aligned dimension, Angular Dimension, Arc Length Dimension, Radius Dimension, Diameter Dimension).	2	CO2 CO3
LLO 10.1 Use Important CAD modes for drawing: Grid, Ortho, Snap, Polar Tracking, Object Snap Tracking.	10	*Important CAD Modes for drawing: Grid, Ortho, Snap, Polar Tracking, Object Snap Tracking.	2	CO2 CO3
LLO 11.1 Draw symbols of different electrical and electronic components using CAD.	11	*Symbols of Electrical and Electronic Components as per SP 30: 2011(NEC 2011) part 1, section 3 or new equivalent IS using CAD.	2	CO1 CO2 CO3
LLO 12.1 Draw Power and control wiring diagram for DOL starter using CAD.	12	*Power and Control wiring diagram of DOL Starter using CAD.	2	CO2 CO3
LLO 13.1 Draw Power and control wiring diagram for Star Delta starter using CAD.	13	*Power and Control wiring diagram of Star Delta Starter using CAD.	2	CO2 CO3
LLO 14.1 Draw General Arrangement (GA) Diagram for DOL/Star delta starter panel or any other electrical panel using CAD.	14	*General Arrangement Diagram for Electrical Panel (Assume suitable dimensions) using CAD.	2	CO2 CO3
LLO 15.1 Draw Single Line Diagram (SLD) of the 11kV/433V distribution substation using CAD software.	15	*Single Line Diagram (SLD) of the 11kV/433V distribution substation using CAD.	2	CO2 CO3 CO4

COMPUTER AIDED DRAWING AND SIMULATION **Course Code : 314008**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 16.1 Draw Single Line Diagram (SLD) of any Industrial Electrical Installation using CAD Software. LLO 16.2 Plot and print drawings to produce hard copies or digital outputs.	16	*Single Line Diagram (SLD) of any Industrial Electrical Installation using CAD Part I.	2	CO2 CO3 CO4
LLO 17.1 Draw Single Line Diagram (SLD) of any Industrial Electrical Installation using CAD Software. LLO 17.2 Plot and print drawings to produce hard copies or digital outputs.	17	*Single Line Diagram (SLD) of any Industrial Electrical Installation using CAD Part II.	2	CO2 CO3 CO4
LLO 18.1 Install simulation software. LLO 18.2 Create new simulation worksheet. LLO 18.3 Use different tools available in software.	18	*Use of simulation software.	2	CO5
LLO 19.1 Build ohms law, series & parallel circuit using simulation software. LLO 19.2 Measure different electrical parameters using software tools.	19	*Simulation for verification of Ohm's law and series & parallel resistances in circuit.	2	CO5
LLO 20.1 Build KCL and KVL Circuit using software. LLO 20.2 Measure electrical parameters using software.	20	*Simulation of Kirchoff's Current Law and Kirchoff's Voltage Law.	2	CO5
LLO 21.1 Build R-L series circuit using software. LLO 21.2 Measure electrical parameters using software. LLO 21.3 Observe Relevant waveforms across each components.	21	*Simulation of R-L series circuit.	2	CO5
LLO 22.1 Build R-C series circuit using software. LLO 22.2 Measure electrical parameters using software . LLO 22.3 Observe Relevant waveforms across each components.	22	Simulation of R-C series circuit.	2	CO5
LLO 23.1 Build PN junction diode circuit using software. LLO 23.2 Observe Diode characteristics.	23	Simulation of VI Characteristics of diode.	2	CO5

COMPUTER AIDED DRAWING AND SIMULATION **Course Code : 314008**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 24.1 Build half-wave rectifier circuit using software. LLO 24.2 Measure different parameters using software. LLO 24.3 Develop P.C.B. layout for a given electrical circuit using software.	24	*Simulation of single phase half-wave rectifier circuit.	2	CO5
LLO 25.1 Build full-wave rectifier circuit using software. LLO 25.2 Measure different parameters using software. LLO 25.3 Develop P.C.B. layout for a given electrical circuit using software.	25	Simulation of single phase full-wave rectifier circuit.	2	CO5
LLO 26.1 Build basic logic gates circuit using software. LLO 26.2 Observe different parameters using software.	26	*Simulation of Basic Logic Gates.	2	CO5
LLO 27.1 Build Triac Lamp Dimmer circuit using software. LLO 27.2 Observe different parameters using software.	27	*Simulation of Triac Lamp Dimmer circuit.	2	CO5
LLO 28.1 Build Half and Full Adder Logic circuit using software. LLO 28.2 Observe different parameters using software. LLO 28.3 Develop P.C.B. layout for a given electrical circuit using software.	28	Simulation of Half and Full Adder Logic circuit.	2	CO5
LLO 29.1 Build Half and Full Subtractor circuit using software. LLO 29.2 Observe different parameters using software.	29	Simulation of Half and Full Subtractor circuit.	2	CO5
LLO 30.1 Build any circuit using software. LLO 30.2 Develop P.C.B. layout for a given electrical circuit using software.	30	P.C.B. Layout Preparation for electrical circuit using software.	2	CO5

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Assignment

- Simulate stair case wiring circuit
- Simulate one switch one bulb house wiring diagram circuit
- Simulate Op-Amp integrator circuit design
- Simulate & Measure average power and power factor with a wattmeter

- Simulate series and parallel RLC circuit
- Study EPLAN software

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	A4 Sketch Book Drawing Material	1,2,3,4
2	Simulation Software List 1) Any Open-Source Software like Scilab. 2) Multisim Educational Version 14.3 3) PSIM 11.1	18,19,20,21,22,23,24,25,26,27,28,29,30
3	CAD Software List 1) Any Open-Source Computer Aided Design (CAD) Software. 2) LibreCAD. 3) AutoCAD Electrical Student Version.	5,6,7,8,9,10,11,12,13,14,15,16,17
4	Computer Sysytem Operating System: 64-bit Windows 8 or higher Processor: 2.5–2.9 Ghz processor / Recommended: 3+ Ghz processor RAM: 8 GB as a minimum, with 16GB being recommended GPU: 1GB of VRAM as a minimum with DirectX 11 support; Recommended: 4 GB of VRAM with DirectX 12 support Storage: 10 GB.	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table) : NOT APPLICABLE

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Teacher should prepare rubrics for Formative assessment
- Each Practical will be assessed for 25 Marks and average of all marks obtained will be considered.

Summative Assessment (Assessment of Learning)

- End Semester assessment of 25 marks for laboratory learning.
- Teacher should prepare rubrics for Summative Assessment.

XI. SUGGESTED COS - POS MATRIX FORM

COMPUTER AIDED DRAWING AND SIMULATION **Course Code : 314008**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	1	1	3	2	-	2			
CO2	3	-	-	3	-	-	2			
CO3	3	-	2	3	1	-	2			
CO4	3	1	3	3	1	2	2			
CO5	3	1	3	3	1	2	2			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Cornel Barbu	Electrician's Book how to Read Electrical Drawings	Lulu.com, ISBN-13: 9781435713208
2	Prof. Sham Tickoo	AutoCAD Electrical 2021: A Tutorial Approach, 2nd Edition	CADCIM Technologies, ISBN-13 9781640571006, 1640571000
3	John Reeder, Reeder	Using Multisim 9 Troubleshooting DC/AC Circuits	Delmar Cengage Learning, ISBN-13 9781111322137, 1111322139

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.kicad.org/	Kicad : This link download Open Source PCB Design Kicad Software
2	https://www.autodesk.com/education/students	AutoCAD : Register and get free student version of LATEST AutoCAD software
3	https://law.resource.org/pub/in/bis/S05/is.sp.30.2011.pdf	This link downloads IS SP:30 2011 (NEC 2011)
4	https://powersimtech.com/products/	PSIM : This link downloads PSIM software demo version
5	https://powersimtech.com/wp-content/uploads/2021/01/PSIM-User-Manual.pdf	This link downloads PSIM software user Manual
6	https://scilab.in/DownloadScilab	Scilab : This link downloads Scilab software
7	https://librecad.org/	LibreCAD : This link downloads Open Source LibreCAD software
8	https://www.falstad.com/circuit/	Falstad : This is an electronics circuit simulator applet
9	https://www.ni.com/en/support/downloads/software-products/download.multisim.html#452133	NI Multisim : This is an electrical and electronics circuit simulator
10	https://www.youtube.com/watch?v=GH-JFXbOcZg&t=71s	Hartley Oscillator circuit simulation on Multisim software

COMPUTER AIDED DRAWING AND SIMULATION **Course Code : 314008**

Sr.No	Link / Portal	Description
11	https://www.youtube.com/watch?v=mzglU-tMgXY	Simulating halfwave and full wave rectifier circuit in multisim
12	https://www.youtube.com/watch?v=szfgbN0GD5A	AutoCAD practice exercise
13	https://www.youtube.com/watch?v=_2d_Tb9bzsQ&t=10s	Series RLC Circuit Simulation using Multisim
14	https://www.youtube.com/watch?v=UKpIGwto47U	Triac Lamp Dimmer Circuit
15	https://youtu.be/9m8ABCSKTec?si=Kuf6ryURVs9hpK49	VI Characteristics of PN junction diode 1N4007

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students