Course Syllabus
Gyanmanjari Diploma Engineering College
Semester – 3

Subject: Computer Aided Electrical Drawing & Drafting – DETEE13111

Type of course: Skill Enhancement Course (SEC)

Prerequisite: Basic knowledge of computer

Rationale:

This course provides hands-on experience with simulation tools used in electrical engineering. Students will learn to model, simulate, and analyze electrical circuits and systems using industry-standard software. The course covers both fundamental concepts and advanced techniques, emphasizing practical applications in various sub-disciplines of electrical engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	100
0	0	4	2	0	0	10	40	50	

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment;

Course Content:

Sr. No.	Course Content	% Weightage
1	**Introduction to CAD Software** • Overview of CAD tools (AutoCAD, PSIM, MATLAB, etc.) • Interface and basic functions • File management and drawing setup	05%
2	**Electrical Symbols & Standards** • Standard symbols for electrical components • Symbol libraries and customization • Understanding electrical diagrams (schematic, single-line, etc.)	15%
3	**Drawing Electrical Schematics** • Creating and modifying electrical schematics • Wiring diagrams and connection details • Labeling and annotation practices	20%
4	**Circuit Design & Layout** • Designing electrical circuits using PSIM software • Creating panel layouts and component placement • Integrating with other design tools	15%
5	**Advanced Circuit Analysis** • Nonlinear circuit simulation (diodes, transistors) • Frequency response analysis • Harmonic analysis and distortion • Noise analysis in circuits	15%
6	**Power Electronics Simulation** • Simulation of power converters (DC-DC, AC-DC, DC-AC)) • Thermal analysis and efficiency optimization • EMI/EMC (Electromagnetic Interference / Compatibility)	15%
7	**Project Management** • Managing large projects and multiple drawings	15%

	• Collaboration tools and version control • Quality assurance and error checking	

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Joint Project Design:** Create a comprehensive electrical system design for a modest commercial building in groups. Every group member is in charge of a certain area (such as data systems, lighting, and power distribution).	10
2	**Handling Issues in the Real World:** Examine an electrical schematic that has been provided, looking for faults and fixing them. Keep a record of the mistakes and the actions taken to fix them.	10
3	**Design and Application of Custom Symbols:** For certain parts not included in the standard library, create a custom symbol library. Utilize these symbols in a project-specific schematic.	10
4	**Modeling and Interpretation:** Create a circuit with PSIM, then export it to a program for electrical stimulation. Conduct a basic analysis and present the results.	10
5	**Applicability of Industry Standards** Investigate and incorporate the most recent industry codes and standards (such as the NEC and IEC) into an electrical design project. Write a report outlining the design's compliance with these requirements.	10
Total		**50**

Suggested Specification table with Marks (Theory): NA

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	NA	NA	NA	NA	NA	NA

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes:

After learning the course the students should be able to:	
CO1	Demonstrate the ability to use CAD tools for creating and editing electrical drawings and schematics
CO2	Accurately utilize standard electrical symbols and comply with industry standards in drafting electrical diagrams
CO3	Create comprehensive electrical schematics, circuit layouts, and wiring diagrams, including annotations and component placements
CO4	Generate detailed documentation, including bills of materials and wiring lists, manage drawing revisions, and ensure quality control in electrical drafting project

List of Practicals:

Sr. No.	Descriptions	Unit. No	Hrs
1	Create a basic electrical drawing using a CAD tool, exploring interface and basic function	1	2
2	Navigate and use the electrical symbol library in CAD software, understanding standard symbols	1	2
3	Draw a simple electrical circuit schematic with basic components like resistors, capacitors, and power source	1	2
4	Develop a single-line diagram for a power distribution system, representing the overall system in a simplified manner	2	2
5	Create a detailed wiring diagram for a control panel, including all connections and wire labels	2	2
6	Practice placing and organizing components on a schematic, ensuring logical and efficient layout	2	2
7	Add labels, annotations, and notes to an electrical drawing for clarity and documentation purposes	3	2
8	Design a panel layout with correct placement of components like breakers, relays, and switches	3	2
9	Model and analyze simple DC circuits using simulation tools	3	2
10	Simulate and analyze AC circuits, including impedance and phasor analysis	4	2
11	Study the transient response of RC and RL circuits using time-domain simulations.	4	2
12	Analyze the frequency response of circuits using Bode plots and Nyquist plots.	4	2
13	Use SPICE to simulate and analyze resistor networks for voltage and current distributions.	5	2

14	Model and analyze the I-V characteristics of diodes in various configurations	5	2
15	Design and simulate digital logic circuits using gates and flip-flops	5	2
16	Simulate basic DC-DC converters (buck, boost) and analyze efficiency and performance	6	2
17	Design and simulate digital filters (low-pass, high-pass) and analyze their frequency response	6	2
18	Implement a PID controller in a simulation environment and analyze its response to step inputs	6	2
19	Design a simple PCB layout and simulate its performance, considering parasitic effects	7	2
20	Develop a comprehensive simulation project that integrates multiple concepts learned throughout the course	7	2

Instructional Method:

- Introduce theoretical concepts and basic principles of Simulation and electrical drafting.
- Follow up with live demonstrations of Simulation software.
- Combine PowerPoint presentations with real-time software demonstrations.
- Provide practical, hands-on experience using Simulation software.
- Schedule regular lab sessions with guided step-by-step lab instructions.
- Encourage collaboration, communication, and teamwork through group projects.
- Assign roles to each member in projects, such as component placement, wiring, or documentation.
- Engage students in assignments requiring critical thinking and problem-solving.
- Design tasks like analysing and correcting faulty schematics, creating custom symbols, and simulating electrical circuits. Provide instructional content (videos, readings) for pre-class review.
- Use class time for interactive exercises, Q&A sessions, and collaborative activities.
- Present real-world case studies to show Simulation application in electrical engineering.
- Have students work on similar projects, analysing challenges and solutions.
- Integrate simulation tools with Simulation for design analysis and validation.
- Teach students to use these tools for verifying and improving their electrical designs.

Reference Books:

[1] AutoCAD Electrical 2024 Black Book" by Gaurav Verma and Matt Weber

[2] Practical Guide to AutoCAD Electrical" by Rakesh K. Tyagi

[3] The SPICE Book" by Andrei Vladimirescu

[4] Circuit Simulation with SPICE OPUS: Theory and Practice" by Tadej Tuma and Árpád Buermen

[5] Electrical Design and Drafting" by J.E. David

[6] Electrical Wiring: Residential" by Ray C. Mullin and Phil Simmons

[7] Interpreting Engineering Drawings" by Ted Giesecke, Alva Mitchell, and Henry C. Spencer

Software:

- MATLAB/Simulink
- PSIM
- Multisim
- CAD
- ANSYS
- FEMM
- Lab facilities equipped with necessary hardware for simulation validation