

**GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT****COURSE CURRICULUM**  
**COURSE TITLE: COMPUTER AIDED ELECTRICAL DRAWING AND**  
**SIMULATION**  
**(Code: 3340905)**

<b>Diploma Programmes in which this course is offered</b>	<b>Semester in which offered</b>
Electrical Engineering	4 <sup>th</sup> Semester

**1. RATIONALE**

All equipment, installations, circuits and other electrical and electronic systems in commercial, power and industrial sector need drawings for their manufacturing, installation, operation and maintenance. A technician working in design and shop floor must possess the skill of reading, interpreting different drawings and simulating electrical and electronics circuit for most of the activities. With the evolution of various computer software's the role of earlier draftsman is now taken over by Computer software. The Computer Aided Drawing (CAD) and simulation (MATLAB/SIMULINK, PSpice, MULTISIM) software will be used to perform various practical exercises in this course. This will enable the students to become competent for working in the fast growing information technology environment by enhancing their computer aided drawing, designing and simulating skills in the field of electrical and electronics engineering.

**2. COMPETENCY**

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency:

- **Draw/simulate electrical and electronics circuit using software.**

**3. COURSE OUTCOMES**

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- Use various symbols and notations in electrical and electronics engineering drawings.
- Interpret drawings, draw interferences and workout other technical details.
- Draw various electrical and electronics circuits according to standard practices using CAD software.
- Simulate/test simple electrical and electronics circuits using Simulation software
- Prepare a PCB for a given mini project.

#### 4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)				Total Credits (L+T+P)	Examination Scheme			
					Theory Marks		Practical Marks	
L	T	P	C	ESE	PA	ESE	PA	100
0	0	4	4	00	00	40	60	

**Legends:** L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit ESE - End Semester Examination; PA - Progressive Assessment.

#### 5. COURSE DETAILS

**Note:** There are no separate theory classes for the theory to be taught as below. The relevant theory has to be discussed before students perform the practical during practical sessions.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
<b>Unit – I Computer Aided Electrical Drawing</b>	1a. List the steps of Computer aided electrical drawing 1b. Draw general graphical symbols and notations used in Electrical engineering using CAD software	1.1 Procedure to be adopted for computer aided drawings 1.2 Electrical machines - AC and DC, motor starters, measuring and display instruments etc.
	1c. Draw various electrical circuits using CAD software. 1d. Draw the cross sectional view of various electrical machines using CAD software. 1e. Draw the winding diagrams of AC and DC machines 1f. Draw lighting and power wiring diagram for a given installation	1.3 R-L series, parallel circuit 1.4 R-C series, parallel circuit 1.5 R-L-C series, parallel circuit 1.6 D.C. machine parts and cross sectional view 1.7 A.C. machine parts and cross sectional view 1.8 A.C. and D.C. winding diagrams Lighting and power wiring diagram

<b>Unit</b>	<b>Major Learning Outcomes (in cognitive domain)</b>	<b>Topics and Sub-topics</b>
<b>Unit– II Computer Aided Electronics Drawing</b>	2a. Draw general graphical symbols and notations used in electronics engineering using CAD software 2b. Draw various electronics circuits using Auto CAD electrical and Electronics software.	2.1 Symbols and notations of: Electronic components - Resistor, Inductor, transformer and Capacitor Semiconductor device Diodes, Zener diode, Transistors PNP/ NPN, Tunnel diode, photo diode, varactor, FET, MOSFET, IGBT, UJT etc. 2.2 Half-wave, full-wave and bridge rectifier, Power amplifier and voltage amplifier and different types of oscillators circuits
<b>Unit– III Simulation of Electrical Circuits</b>	3a. List the steps of using Simulation software in Electrical engineering 3b. State the procedure to build simple circuits 3c. Build, Simulate and test simple electric circuits. 3d. State the steps to generate graphics and plot Waveform/ response for analysis	3.1 Getting started, ending, commonly used blocks, Creating a model, Assigning Variables, Observing Variables during Simulation, Storing/Saving Data, Creating and Masking Sub-systems 3.2 Series and parallel R-L circuit, 3.3 Series and parallel R-C circuit, 3.4 Series and parallel R-L-C circuit 3.5 Resonance in AC Circuit and 3.6 Electrical machines circuits 3.7 Graphics, Plot, sub plot, label, legend etc.
<b>Unit–IV Simulation of Electronics Circuits</b>	4a. Build, Simulate and test simple electronic circuits.	4.1 Half wave, full wave and bridge rectifier 4.2 Power amplifier and voltage amplifier 4.3 Different types of oscillators circuits
<b>Unit-V Computer Aided PCB Design</b>	5a. Design PCB using computer software	5.1 Overview of software for PCB design 5.2 PCB layout of rectifier circuit 5.3 PCB layout of amplifier circuit 5.4 PCB layout of oscillator circuit

**6. SUGGESTED SPECIFICATION TABLE WITH HOURS and MARKS (THEORY)**

Not Applicable

**7. SUGGESTED LIST OF EXERCISES/PRACTICALS**

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills (**outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

*Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes** (as given in a common list at the beginning of curriculum document for this programme) would be assured.*

*Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.*

S. No.	Unit No.	Practical Exercises (outcomes mainly in psychomotor domain)	Approx Hrs. required
1	I	Draw electrical and electronic symbols using CAD and take print out	04
2	I	Draw D.C. and A.C machine parts using CAD and take print out	04
3	I	Draw winding diagram for given DC machine using CAD and take print out of (a)Lap winding and (b)Wave winding	04
4	II	Draw different types of rectifier circuit using CAD and take print out of : (a)Single phase half wave (b)Single phase full wave (c)Bridge rectifier	02
5	II	Draw R-C couple amplifier circuit using CAD and take print out	02
6	II	Draw the following oscillator circuit using CAD and take print of (a)Hartley oscillator (b)Colpitt oscillator (c) Phase-Shift Oscillator (d) Wien Bridge Oscillator (e)Crystal Oscillator	06
7	III	Simulate three resistances in series circuit and find out voltage and current in each resistance .	02
8	III	Simulate the following circuits and find out voltage and current in each resistance. (a)Two resistances in parallel (b)Resistance and inductor in parallel	02
9	III	Simulate a given complex circuit having combination of series-parallel resistances and find out current and voltage across each resistor. (Students can use circuit which asked in exams of D.C. Circuits course.)	02
10	III	Simulate R-L series circuit and observe voltage wave forms across each component.	02
11	III	Simulate R-C series circuit and observe voltage wave forms across each component.	02
12	III	Simulate R-L-C series circuit and observe voltage wave forms across each component.	02

S. No.	Unit No.	Practical Exercises (outcomes mainly in psychomotor domain)	Approx Hrs. required
13	III	Simulate R-L parallel circuit and observe current wave forms across each component.	02
14	III	Simulate R-C parallel circuit and observe current wave forms across each component.	02
15	III	Simulate R-L-C parallel circuit and observe current wave forms across each component.	02
16	III	Simulate star connection using resistors and observe voltage current relation of line and phase.	02
17	III	Simulate delta connection using resistors and observe voltage current relation of line and phase.	02
18	III	Simulate one switch one bulb house wiring diagram circuit.	02
19	III	Simulate stair case wiring circuit.	02
20	IV	Simulate single phase half-wave rectifier circuit.	02
21	IV	Simulate single phase full-wave rectifier circuit.	02
22	IV	Simulate single phase bridge rectifier circuit.	02
23	IV	Simulate single phase half-wave rectifier circuit.	02
24	IV	Simulate single phase half-wave rectifier circuit.	02
25	IV	Using CRO find out voltage across resistors.(simulation)	02
26	IV	Using CRO find out unknown frequency by comparing it with known frequency.	02
27	IV	Simulate basic logic gates.	02
28	IV	Using simulation prove that NAND gate is universal gate.	02
29	IV	Using simulation prove that NOR gate is universal gate.	02
30	IV	Using simulation prove De Morgan's theorem.	02
31	IV	Using simulation prove half adder and full adder circuit.	02
32	IV	Using simulation prove half subtractor and full subtractor circuit.	02
33	V	Develop P.C.B. layout for a given electrical circuit using software	04
34	V	Develop P.C.B. layout for a given electronics circuit using software	02
<b>Total Hours</b> (perform any practical worth 56 hours from above depending upon the availability of resources so that most units are covered)			<b>60</b>

## 8. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities such as:

- i. Download open source simulation software for electrical and electronics circuits on internet.
- ii. Validate the simulation results with results obtained from performing experiments.
- iii. Seminar on various simulation software.
- iv. Design a PCB for a given project using software

## 9. SPECIAL INSTRUCTIONAL STRATEGIES (IF ANY)

Mini project may be given on CAD and simulating electrical and electronics circuits. Students should be asked to design a PCB to fabricate the circuit of mini project using software

## 10. SUGGESTED LEARNING RESOURCES

### A) List of Books

S. No.	Title of Book	Author	Publication
1	AutoCAD 2013 for Engineers and Designers.	Sham Tickoo	Dream tech press, New Delhi, Latest edition
2	Mastering AutoCAD 2013 and AutoCAD LT 2013	George Omura	Sybex, New Delhi, Latest edition
3	Mastering electronics workbench: Version 5 and Multisim Version 6	John Adams	McGraw-Hill, New Delhi, Latest edition
4	Introduction to PSpice Using OrCAD For Circuits And Electronics	Muhammad H. Rashid	PHI Learning, New Delhi, Latest edition

### B) List of Software/Learning Websites

- i. Open Source Softwares preferred.
- ii. AutoCAD
- iii. Work bench
- iv. PSIM
- v. SPICE (Simulation Program with Integrated Circuit Emphasis).....
- vi. Orcad for pcb design.....
- vii. Circuit maker
- viii. Multi-Sim
- ix. <http://coolcadelectronics.com/coolspice/> )
- x. <http://students.autodesk.com/> (register and get free student version of LATEST AutoCAD software for approximately 3 years)
- xi. <http://www.circuitstoday.com/circuit-design-and-simulation-softwares>
- xii. [http://en.wikipedia.org/wiki/List\\_of\\_free\\_electronics\\_circuit\\_simulators](http://en.wikipedia.org/wiki/List_of_free_electronics_circuit_simulators)
- xiii. <http://coolcadelectronics.com/coolspice/>
- xiv. Android applications available on Google Play store like AutoCAD 360, Circuit Builder, Electric Circuit, Circuit Simulator, WeSpice Demo, Electric Circuit Calculator, Electrical Engineering

## 11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

### Faculty Members from Polytechnics

- **Prof. H. C. Chawda**, Lecturer in Electrical Engineering, RCTI, Ahmedabad.
- **Prof. R. D. Panchal**, Lecturer in Electrical Engineering, RCTI, Ahmedabad.
- **Prof. V. S. Tejwani**, Lecturer in Electrical Engineering, Govt. Polytechnic, Rajkot
- **Prof. A. A. Amin**, Lecturer in Electrical Engineering, Govt. Polytechnic, Vadnagar

### Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. (Mrs.) C S Rajeshwari**, Head of Department of Electrical and Electronics Engineering.
- **Prof. (Mrs.) Anjali Potnis**, Assistant Professor, Department of Electrical and Electronics Engineering.