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EDA TOOLS **Course Code : 313013**

Programme Name/s : Electronics & Computer Engg.

Programme Code : TE

Semester : Third

Course Title : EDA TOOLS

Course Code : 313013

I. RATIONALE

Electronic Design Automation (EDA) tools are software tools used to create, modify, analyze and optimize electronic system. EDA tools enable designers to simulate and validate their designs before physical implementation or manufacturing. Students can learn a variety of skills through EDA tools, including troubleshooting and how various devices and system work together. Working on EDA tools prepare student for present industrial need.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to attend following industry/employer excepted outcome through various teaching learning experiences:
Use basic concepts of Electronic Design Automation (EDA) tools for various applications.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Use EDA tools to simulate the simple circuits.
- CO2 - Develop Analog circuits and test the output using EDA tool.
- CO3 - Analyze Digital circuits for the given input using EDA tool.
- CO4 - Develop various miscellaneous circuits using EDA tool.
- CO5 - Use EDA tool to develop PCB Layout for the given electronic circuit.

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	
313013	EDA TOOLS	EDT	SEC	-	-	4	-	4	2	-	-	-	-	-	25	10	25@	10	-	-	50

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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 State main features of given EDA tool. TLO 1.2 Explain use of different windows to perform various operations of given EDA tool. TLO 1.3 Describe the procedure to create new file in the given EDA tool software. TLO 1.4 Explain the procedure to make changes in the given file.	**Unit - I Introduction to EDA Tools** 1.1 Need of EDA tools 1.2 Applications of EDA tools 1.3 Introduction to different EDA tools: eSim, EasyEDA, Kicad, Multisim, Proteus, SCILAB, MATLAB or any other EDA tool 1.4 Steps for Installation of EDA tools 1.5 Features of EDA tools: open file, create new file, run simulation, virtual instrument. 1.6 Editing windows, functions, controls 1.7 File format, report generation in the given EDA tool	Demonstrations Presentations Hands-on Chalk-Board
2	TLO 2.1 List steps to develop rectifier circuits using EDA tool. TLO 2.2 Select desired components to obtain ripple free output. TLO 2.3 Interpret the transient behavior of single and two stage amplifier using given transistor. TLO 2.4 Interpret the transient behavior of single and two stage amplifier using FET/MOSFET.	**Unit - II Analog Circuits** 2.1 Rectifiers: Design of Half wave, Full wave (bridge rectifier and center tapped) with input and output waveform 2.2 Rectifier with shunt capacitor, series inductor, LC and CLC filter 2.3 Single and multi stage amplifier by using BJT 2.4 Single and multi stage amplifier by using JFET/MOSFET	Demonstration Presentations Chalk-Board Hands-on

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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 List different logic gates available in the library of EDA tool. TLO 3.2 List different types of MUX and DEMUX ICs available with EDA tool. TLO 3.3 List different types of flip-flops available with EDA tool. TLO 3.4 Use the given flip-flop to construct specific type of counters and shift register.	**Unit - III Digital Circuits** 3.1 Combinational circuit: Logic Gates, Boolean Expression 3.2 Adder, Subtractor 3.3 Multiplexer, De-multiplexer, Encoder, Decoder 3.4 Sequential Circuits: One bit memory cell, SR flip-flop, JK flip-flop, D flip-flop, T flip-flop, 3.5 Counters: Synchronous and Asynchronous Counter 3.6 4 bit universal Shift register	Chalk-Board Presentations Hands-on
4	TLO 4.1 Calculate modulation index of AM and FM wave. TLO 4.2 Observe radiation pattern for various antenna.	**Unit - IV Miscellaneous Circuits** 4.1 Need for Modulation 4.2 Amplitude Modulation: Modulation index, Representation of AM wave in time and frequency domain 4.3 Frequency Modulation: Modulation index, Representation of FM wave in time and frequency domain 4.4 Antenna: Radiation pattern, frequency and length of different antennas	Demonstration Chalk-Board Hands-on
5	TLO 5.1 List different types of PCB. TLO 5.2 Test the performance of voltage regulator.	**Unit - V PCB Layout Design** 5.1 DC regulated power supply 5.2 Voltage regulator: Zener diode as voltage regulator 5.3 Switch mode power supply	Demonstration Educational Videos Hands-on

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 Choose different components available in the library of EDA tool.	1	*Identification of components and virtual instruments available in EDA tool.	2	CO1
LLO 2.1 Choose appropriate tab to create new project using EDA tool.	2	*Create new file using given EDA tool.	2	CO1
LLO 3.1 Choose suitable diode and resistor to develop Half wave rectifier circuit. LLO 3.2 Observe change in input and output waveforms.	3	*Simulate Half wave rectifier and observe input output waveforms.	2	CO2
LLO 4.1 Select required components to develop Half wave rectifier with shunt capacitor filter. LLO 4.2 Observe change in input and output waveforms.	4	Simulate Half wave rectifier with shunt capacitor filter and observe input output waveforms.	2	CO2

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 5.1 Select different components available in the library to develop Full wave rectifier circuit. LLO 5.2 Observe change in input and output waveforms.	5	*Simulate Full wave rectifier and observe input output waveforms.	2	CO2
LLO 6.1 Select desired components to build Full wave rectifier circuit. LLO 6.2 Select appropriate filter for getting pure DC output.	6	Simulate Full wave rectifier with LC,Pi filter observe input and output waveforms.	2	CO2
LLO 7.1 Select appropriate transistor to develop single stage amplifier. LLO 7.2 Observe frequency response of given amplifier.	7	*Simulate single stage amplifier using BJT to observe frequency response.	2	CO2
LLO 8.1 Select appropriate FET/MOSFET for given amplifier. LLO 8.2 Observe frequency response of given amplifier.	8	Simulate single stage amplifier using FET/MOSFET to observe frequency response.	2	CO2
LLO 9.1 Develop circuit for multistage amplifier by selecting different components available in EDA tool. LLO 9.2 Observe frequency response of given amplifier. LLO 9.3 Calculate cutoff frequency for given amplifier.	9	*Interpret DC and Transient analysis of two stage RC coupled amplifier using BJT. Observe frequency response using virtual spectrum analyzer.	2	CO2
LLO 10.1 Select required component to build two stage RC coupled amplifier using FET/MOSFET. LLO 10.2 Observe frequency response of given amplifier. LLO 10.3 Calculate cutoff frequency of the given amplifier.	10	Interpret DC and Transient analysis of two stage RC coupled amplifier using FET/MOSFET Observe frequency response using virtual spectrum analyzer.	2	CO2
LLO 11.1 Identify symbols of various Logic gates available in EDA tool library. LLO 11.2 Verify truth table for various Logic gate.	11	*Test functionality of Logic gates.	2	CO3
LLO 12.1 Select required gates to develop circuit for Half and Full adder circuit.	12	*Simulate Half and Full adder using EDA tool.	2	CO3
LLO 13.1 Select desired IC from library to develop 8:1 MUX. LLO 13.2 Choose required select lines to develop 8:1 MUX.	13	*Simulate 8:1 multiplexer using EDA tool.	2	CO3

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 14.1 Select desired IC to develop 1:8 DEMUX. LLO 14.2 Verify data flow of DEMUX for different select lines.	14	Simulate 1:8 De-multiplexer using EDA tool.	2	CO3
LLO 15.1 Make necessary connection to develop RS,JK flip-flop. LLO 15.2 Verify truth table of RS,JK flip-flop.	15	*Simulate RS,JK flip-flops and observe output on virtual logic analyzer.	2	CO3
LLO 16.1 Select required IC to design D,T flip-flops.	16	Simulate D,T flip-flops and observe output on virtual logic analyzer.	2	CO3
LLO 17.1 Select required number of flip-flops to develop Synchronous counter. LLO 17.2 Choose appropriate clock signal for Synchronous counter.	17	*Simulate modulo-N Synchronous counter using flip-flop and verify output using virtual logic analyzer.	2	CO3
LLO 18.1 Choose desired flip flop to develop universal shift register.	18	Simulate 4 bit universal shift register verify output using virtual logic analyzer.	2	CO3
LLO 19.1 Analyze the behavior of generated AM wave.	19	*Generate AM wave for various carrier frequencies using EDA tool.	2	CO4
LLO 20.1 Analyze the behavior of generated FM wave.	20	*Generate FM wave using EDA tool.	2	CO4
LLO 21.1 Observe radiation pattern of different types of antenna.	21	Plot radiation pattern of different types of antenna using EDA tools.	2	CO4
LLO 22.1 Prepare PCB layout for given circuit. LLO 22.2 Use EDA tool to develop 3D view of circuit.	22	Develop PCB Layout of Half wave rectifier circuit using EDA Tool.	2	CO5
LLO 23.1 Use EDA tool to develop 3D view of circuit. LLO 23.2 Generate footprint for given circuit.	23	Develop PCB layout of Full wave rectifier circuit with LC filter using EDA tool.	2	CO5
LLO 24.1 Develop PCB layout for given circuit. LLO 24.2 Use EDA tool to develop 3D view of circuit.	24	*Develop PCB Layout of Full wave rectifier with Pi filter using EDA Tool.	2	CO5
LLO 25.1 Observe voltage and waveform at different stages. LLO 25.2 Select appropriate components to develop circuit.	25	Simulate regulated power supply circuit.	2	CO5
LLO 26.1 Use EDA tool to develop 3D view of circuit. LLO 26.2 Generate footprint for given circuit.	26	*Develop single sided PCB layout of Regulated Power supply.	2	CO5
LLO 27.1 Select appropriate zener diode for given output voltage.	27	*Simulate zener regulator circuit.	2	CO5

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs

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)

Micro project

- NOT Applicable

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	EDA tools like: EasyEDA /eSim/MultiSim/Scilab/Protues/KiCAD/MATLAB or any other open source EDA software	All
2	Personal Computer: 8 GB RAM,500 GB HDD/SSD,i3 or higher processor	All

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

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- For formative assessment of laboratory learning 25 marks.
- Each practical will be assessed considering 60% weightage to process, 40% weightage to product.

Summative Assessment (Assessment of Learning)

- End semester summative assessment is of 25 marks for laboratory learning.

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XI. SUGGESTED COS - POS MATRIX FORM

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	1	2	2	2	1	1	1			
CO2	1	2	3	2	1	1	1			
CO3	1	2	3	2	1	1	1			
CO4	1	2	3	2	1	1	1			
CO5	1	3	3	2	2	1	1			

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	Mark D. Birnbaum	Essential Electronic Design Automation (EDA)	Publisher(s): Pearson, October 2003, ISBN: 0131828290
2	Peter Kattan	MATLAB for Beginners: A Gentle Approach	Peter I Kattan, September 2009, ISBN:978-0578036427

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://easyeda.com/	EDA tool for analog circuit, digital circuit and PCB design
2	https://esim.fossee.in/home	EDA tool for analog circuit, digital circuit and PCB design
3	https://www.multisim.com/	EDA tool for analog circuit, digital circuit and PCB design
4	http://www.kicad-pcb.org	EDA tool for analog circuit, digital circuit and PCB design
5	https://spoken-tutorial.org/tutorial-search/?search_foss=KiCad&search_language=English	Spoken Tutorials for KiCad
6	https://spoken-tutorial.org/tutorial-search/?search_foss=eSim&search_language=English	Spoken Tutorials for eSim
7	https://spoken-tutorial.org/tutorial-search/?search_foss=Scilab&search_language=English	Spoken Tutorials for Scilab
8	https://www.youtube.com/watch?v=7h33KDtKXEg&list=PLWiMVu6LCYtCtiyv7qNSjcuem9y__UwFk	Video demonstration for EasyEDA
9	https://image.easyeda.com/files/EasyEDA-Tutorial_v6.4.32.pdf	EasyEDA Tutorial

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Sr.No	Link / Portal	Description
10	https://www.scilab.org/sites/default/files/Scilab_beginners.pdf	Scilab Tutorial
11	https://download.ni.com/support/manuals/374485a.pdf	Multisim component reference guide
12	https://www.youtube.com/watch?v=dEG_hv5E8VQ	Video demonstration for AM wave generation
13	https://www.youtube.com/watch?v=AlZm0wTTQCs	Video demonstration for FM wave generation

Note :

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

MSBTE Approval Dt. 02/07/2024 **Semester - 3, K Scheme**