Basic Electrical and Electronics Engineering Laboratory

Course Code: ECE-279

University Mission and Vision

University Vision

To be a premier academic institution, recognized internationally for its contribution to industry and society through excellence in teaching, learning, research, internationalization, entrepreneurship and leadership.

University Mission

M1.To transforms education through academic rigour, practical orientation and outcome based teaching.

M2. To develop and implement a relationship of cooperation between industry and academia.

M3. To undertake impactful research addressing local, national and global challenges.

M4. To prepare graduates to be lifelong learners with strong analytical and leadership skills.

M5. To develop global professionals and entrepreneurs with innovative spirit, tolerance and desire to make a difference to the society.

Program Outcomes

PO1 : Engineering Knowledge : Apply the knowledge of mathematics, science, engineering fundamentals, andan engineering specialization to the solution of complex engineering problems.

PO2 : Problem Analysis : Identify, formulate, review research literature, and analyse complex engineeringproblems reaching substantiated conclusions using first principles of mathematics, natural sciences andengineering sciences.

PO3 : Design/Development of Solutions : Design solutions for complex engineering problems and designsystem components or processes that meet the specified needs with appropriate consideration for thepublic health and safety, and the cultural, societal, and environmental considerations.

PO4 : Conduct investigations of complex problems : Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 : Modern Tool Usage : Create, select, and apply appropriate techniques, resources, and modernengineering and IT tools including prediction and modelling to complex engineering activities with anunderstanding of the limitations.

Program Outcomes

PO6 : The Engineer and Society : Apply reasoning informed by the contextual knowledge to assess societal,health, safety, legal and cultural issues and the consequent responsibilities relevant to the professionalengineering practice.

PO7 : Environment and Sustainability : Understand the impact of the professional engineering solutions insocietal and environmental contexts, and demonstrate the knowledge of, and need for sustainabledevelopment

PO8 : Ethics : Apply ethical principles and commit to professional ethics and responsibilities and norms of theengineering practice.

PO9 : Individual and Team Work : Function effectively as an individual, and as a member or leader in diverseteams, and in multidisciplinary settings

PO10 : Communication : Communicate effectively on complex engineering activities with the engineeringcommunity and with society at large, such as, being able to comprehend and write effective reports anddesign documentation, make effective presentations, and give and receive clear instructions.

PO11 : Project Management and Finance : Demonstrate knowledge and understanding of the engineering andmanagement principles and apply these to one's own work, as a member and leader in a team, to manageprojects and in multidisciplinary environments.

PO12 : Life-long Learning : Recognize the need for, and have the preparation and ability to engage in independentand lifelong learning in the broadest context of technological change.

Programme Specific Outcomes

PSO1 : Apply basic knowledge in the areas such as Software Engineering, Networking amp Security, Database Management Systems, Intelligent Systems, Operating Systems and System Architecture for building Software products.

PSO2 : Attain the ability to design and develop software based systems, evaluate and recognize potential risks and provide creative, economical and optimal solutions.

PSO3 : Provide effective and efficient real time solutions using attained knowledge in inter-disciplinary domains for societal benefits through projects.

PSO4 : Ability to adapt future technologies through acquired skills and knowledge to ideate, design, test and deploy solutions for different business environments.

Summary

Program outcome

PO1	Engineering Knowledge
PO2	Problem Analysis
PO3	Design/development of the solution
PO4	Conduct investigations of complex problems
PO5	Modern tool usage
PO6	The engineer and society
PO7	Environment and sustainability
PO8	Ethics
PO9	Individual and teamwork
PO10	Communication
PO11	Project Management and finance
PO12	Life – long learning.

Program outcome and Course Outcome mapping

PO-CO Mapping

1. Problem Analysis
2. Design / Development of the Solution
3. Modern Tool usage
4. Individual and teamwork
5. Life-long learning

LTP detail L:0 T:0 P:2 Credit:1

Course Outcomes

	Course Outcome Statement	Practical number
CO1	Learn to use basic electrical & electronics measuring instruments and component specific ratings.	All practical
CO2	Use basic electrical laws and theorems to analyse DC circuits.	P1 and P2
CO3	Build virtual applications with a sensor module by programming microcontroller board.	P6
CO4	Make use of various digital & analogue ICs and conduct their functionality test.	P3, P4, P5, P7, P8
CO5	Assemble various electrical & electronics components on the breadboard and create circuit connections.	P1 to P5, P7, P8
CO6	Design and analyse combinational and sequential circuits.	P5, P7, P8

List of Experiment

List of Practicals / Experiments:

Kirchhoff voltage law and Kirchhoff current law

- Implement Kirchhoff voltage and current laws.

Thevenin's Theorem

- Apply Thevenin's theorem on DC circuits.

Semiconductor devices

- Analyse V-I characteristics of PN Junction diode.

Logic Gates and Universal Gates

- Understanding the truth table of Logic Gates and implement these gates using Universal gates.

Analysis and Synthesis of Logic Functions using Multiplexer.

- Understanding the combinational logic by implementing the boolean function using multiplexer

Arduino board and its peripherals

- Virtual integration of IR sensor using Arduino

Analysis and Synthesis of Flip-Flops

- Analyze JK Flip-Flop and implement T-Flip Flop using NAND based circuit of JK Flip Flop.

Analysis of Functions of BCD-TO-7-segment Decoder / Driver and Operation of 7-segment LED Display

- Implement Decade counter using IC-7490 and seven segment display.

References

1. BASIC ELECTRICAL AND ELECTRONICS ENGINEERING | SECOND EDITION by D P KOTHARI AUTHOR), I J NAGRATH (AUTHOR), MCGRAW HILL EDUCATION
2.DIGITAL DESIGN PRINCIPLES AND PRACTICES PEARSON by JOHN F. WAKERLY, PEARSON
3. DIGITAL INTEGRATED ELECTRONICS by H. TAUB AND D. SCHILLING, MC GRAW HILL
4. INTERNET OF THINGS by RAJ KAMAL, MCGRAW HILL EDUCATION

Evaluation Criteria

- Attendance 5 Marks, CA- 45 Marks, ETP- 50 Marks
- Total Academic task: 6 (each of 30 marks)
  - Test:4 (best 3 out of 4)
    - (15 MCQs for 45 minutes)
      - (question pattern: 8 question evaluating student understanding/ conduct of the practical (eg procedure, precautions, circuit diagram, worksheet etc.).
      - 4 questions for testing the instruments/apparatus knowledge related to practical (eg Voltmeter, Ammeter, power supply, trainer module, related specifications etc.) and
      - 3 questions related to components used in the practical (breadboard/resistance/ IC's etc) ::::platform OAS/google form/hardcopies etc.
  - Written test Practical (WTP): 2 (compulsory)
    - (15 marks for writeup any one experiment out of four,(Writeup consist of Apparatus/list of components with specifications(2M), Circuit diagram/ IC Connection diagram etc(4M), Procedure(3M), Observations and calculations(3M), Result Analysis(2M), Precautions(1M)
    - 15 marks for individual performance (Evaluate the connection diagram, working mode l, Learning Outcome, Error Analysis)
  - Each academic task has 9 marks weightage

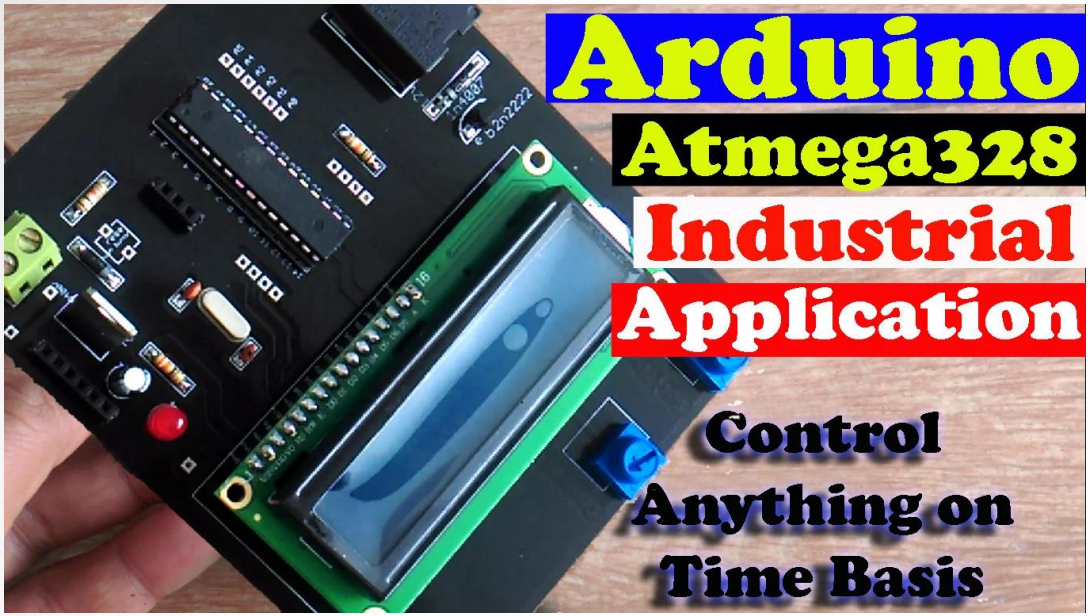
Mode of Conduct

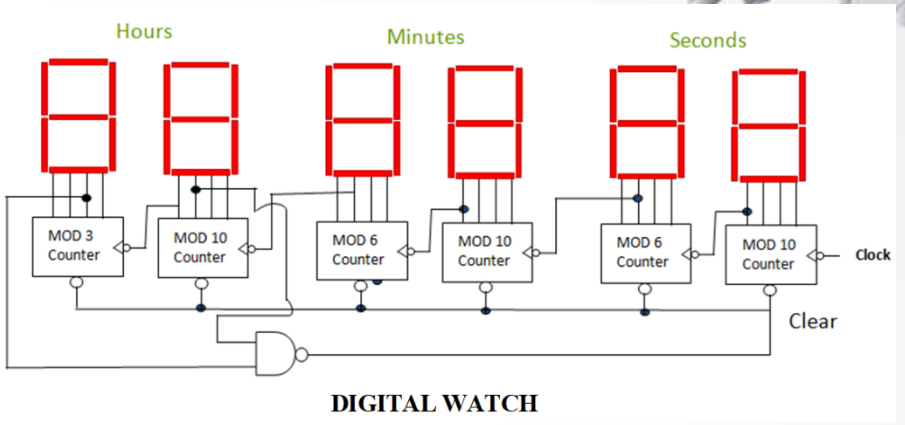
- Allocation of CAP-1,2,3,4, WTP-1, WTP-2 as per schedule mentioned in IP.
- Same practical for all students of the group, student group size is 4 (9 Groups in a Lab)
- Lab manual is mandatory for the student to attend the lab class.
- Attendance to be marked in 1st ten minutes of each hour.
- On day of conduct: first 20-30 minutes to explain and demonstrate the practical on the white board and clear the doubts of students.
- Student will perform the practical and prepare workbook alongside. Faculty is required to supervise the students learning performance and ensure that all students of the group have performed and updated the performance on the workbook. Faculty will visit the student groups to ensure the performance accomplishment.

Add on information:Virtual Lab Based Experiment

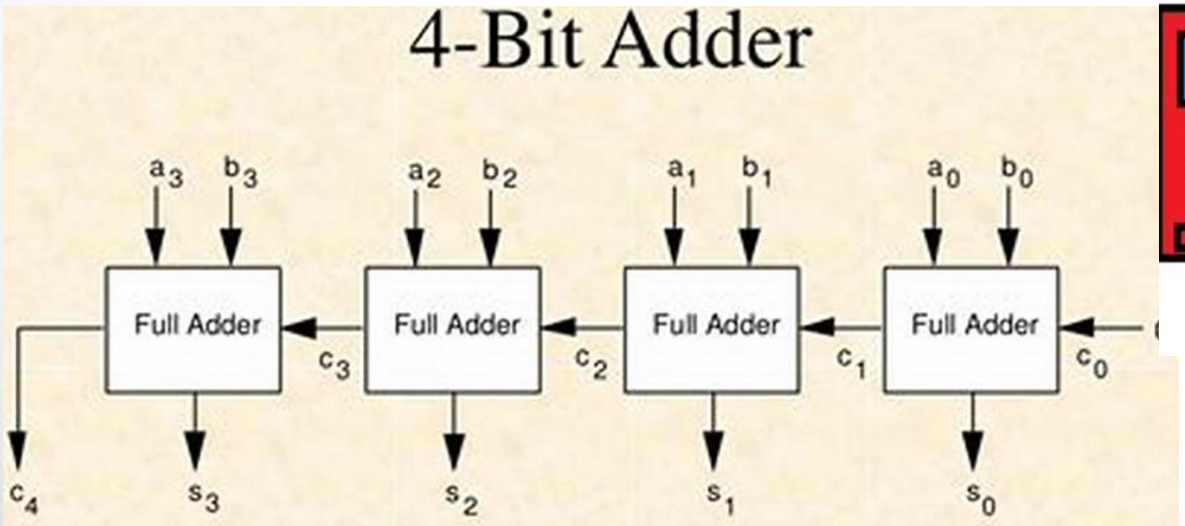
Exp. No	Practical Name	Virtual Lab Link
P2	**Apply Thevenin's theorem** on DC circuits.	http://vlabs.iitkgp.ac.in/asnm/exp3/index.html
P3	Analyse V-I characteristics of PN Junction diode.	http://vlabs.iitkgp.ac.in/be/exp5/index.html
P4	Understanding the truth table of Logic Gates and implement these gates using Universal gates.	https://de-iitr.vlabs.ac.in/exp/truth-table-gates/ https://de-iitr.vlabs.ac.in/exp/realization-of-logic-functions/
P5	Understanding the combinational logic by implementing the Boolean function using a multiplexer.	https://de-iitr.vlabs.ac.in/exp/multiplexer-demultiplexer/
P7	Understand JK Flip-Flop and implement T-Flip Flop using NAND circuit of JK Flip Flop.	https://de-iitr.vlabs.ac.in/exp/truth-tables-flip-flops/

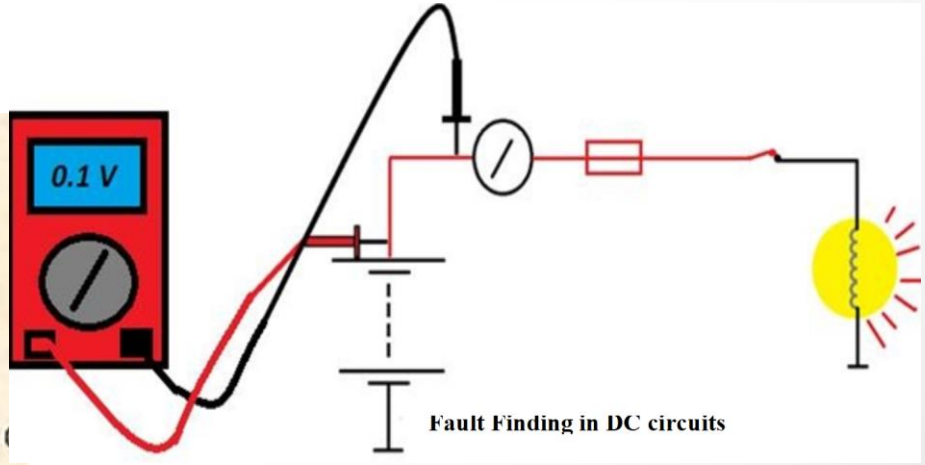
Applications related to the Lab





DIGITAL WATCH





Fault Finding in DC circuits

About the Software

- Proteus is the product of Lab-center Electronics Ltd
- The Proteus Design Suite is a Windows application for schematic
- capture, simulation, and PCB (Printed Circuit Board) layout design.
- **Link to downloads**

https://www.malavida.com/en/soft/proteus/download

Let’s Start

Thank you