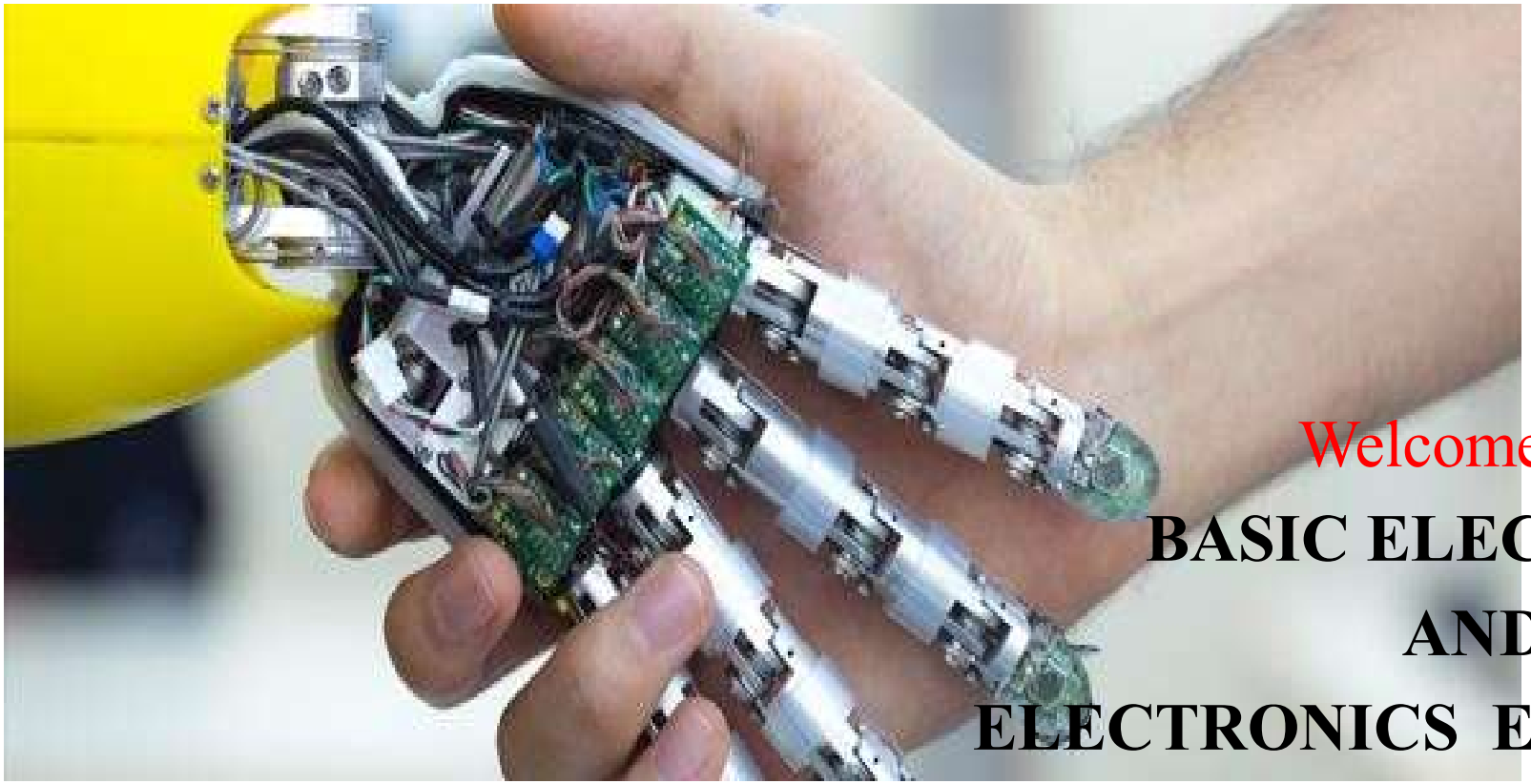
Lecture 0



Welcome ! to

BASIC ELECTRICAL

AND

ELECTRONICS ENGINEERING

Course Code: ECE 249

Course Outcomes

Course Outcomes:

Through this course students should be able to:

CO1 :: Learn to use basic circuit components and calculate related parameters for DC circuit.

CO2 :: Understand the working of semiconductor devices and use them in various applications.

CO3 :: Understand and examine the structure of various number system and its application in digital circuit design.

CO4 :: Develop applications by programming an Arduino board to interface sensor modules.

CO5 :: Construct combinational circuit with application-specific integrated circuit and logic gates.

CO6 :: Develop sequential circuits with flip-flops, logic gates and IC's for various applications.

Program Outcome

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Program Outcomes

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

PO-CO Mapping

1. Engineering Knowledge
2. Problem Analysis
3. Modern Tool usage
4. Individual and teamwork
5. Life-long learning

Reference Books

References:

1. FUNDAMENTALS OF ELECTRICAL ENGINEERING AND ELECTRONICS by B.L.THERAJA, S. CHAND & COMPANY

2. DIGITAL FUNDAMENTALS BY THOMAS L. FLOYD , R. P JAIN, PEARSON by THOMAS L. FLOYD , R. P JAIN, PEARSON

3. BASIC ELECTRICAL AND ELECTRONICS ENGINEERING by D.P. KOTHARI, I J. NAGRATH, MCGRAW HILL EDUCATION

4. ELECTRONIC CIRCUIT FUNDAMENTALS AND APPLICATIONS by MIKE TOOLEY, NEWNES PUBLISHERS

5. DIGITAL ELECTRONICS PRINCIPLES,DEVICES AND APPLICATIONS by ANIL K. MAINI, WILEY

Course Assessment Model

Marks Break Up:

Attendance	5
CA (Two best out of Three)	25
MTE	20
ETE	50
Total	100

The course content Before MTE

Unit I

Fundamentals of DC and AC circuits : resistance, inductance, capacitance, voltage, current, power and energy concepts, ohm's law, Kirchhoff's laws, voltage division rule, current division rule, dependent and independent sources, mesh and nodal analysis, Thevenin's theorem Norton's theorem, alternating current and voltage, definitions of amplitude and phase, average and RMS value of an AC signal

Unit II

Fundamental of semiconductor devices : PN junction diode (working and characteristics) and its applications, Bipolar junction transistor (PNP and NPN), MOSFET (types and applications), Op-amp(features and virtual ground concept), Op-amp (inverting and non-inverting)

Unit III

Introduction to number system and logic gates : Number system (conversion) and codes (B-G,G-B,Excess-3,BCD), logic gates, CMOS logic gates, Boolean algebra, SOP and POS, K- Map (up to 4 variables)

The course contents After MTE

Unit IV

Introduction of Arduino and Sensors : Arduino board (pin configuration and description), IR sensor, LDR, basic principle of ultrasonic sensor, Temperature sensor

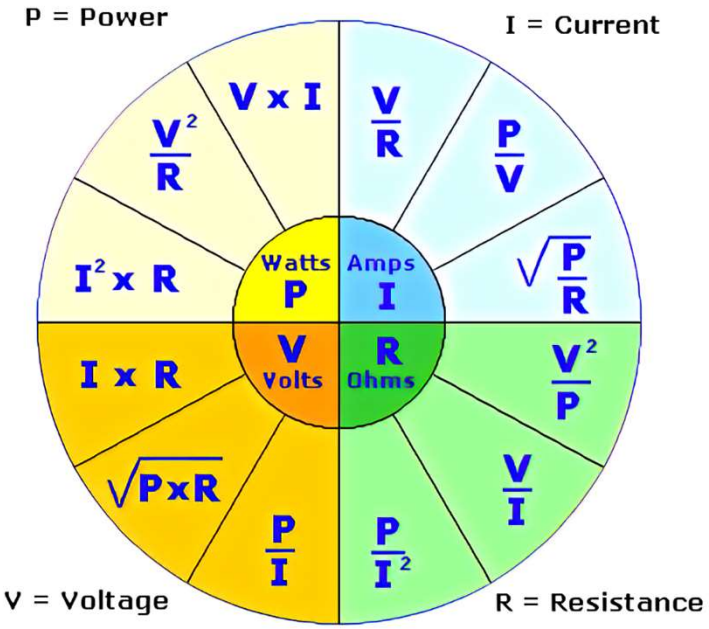
Unit V

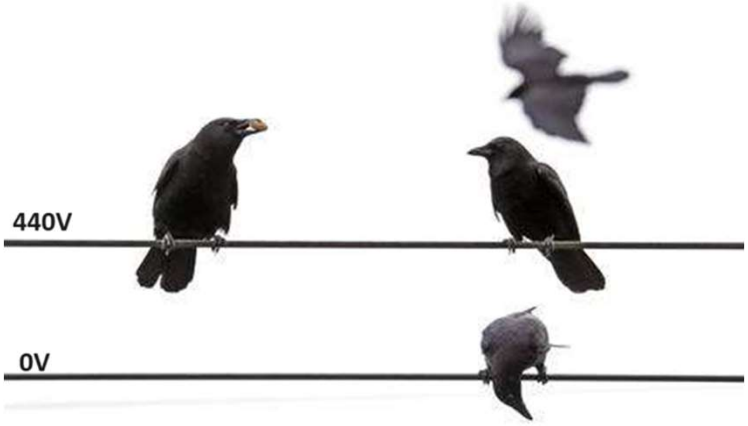
Introduction to Combinational Logic Circuits : Adders, Subtractors, Comparators, Multiplexers and De-multiplexers, Decoders, Encoders, Parity circuits

Unit VI

Introduction to Sequential Logic Circuits : Basic sequential circuits: SR-latch, D-latch, D flip-flop, JK flip- flop, T flip-flop, Master Slave JK flip flop, Conversion of basic flip-flop, Registers: Operation of all basic Shift Registers, Ring counter and Johnson ring counter, Counters: Design of Asynchronous, Synchronous counters, Decade counter using IC-7490

Unit- 1: Fundamentals of DC and A.C Circuits





Both legs of a crow are either at 440V or 0 V, so no current flows between two legs of the crow=> Crow remains alive

One leg of a bat is at 440V and other leg at 0 V, so a HIGH current flows : From body part at 440V to other body part on 0V=> bat dies as current is very high.

AC vs DC

Comparison Chart

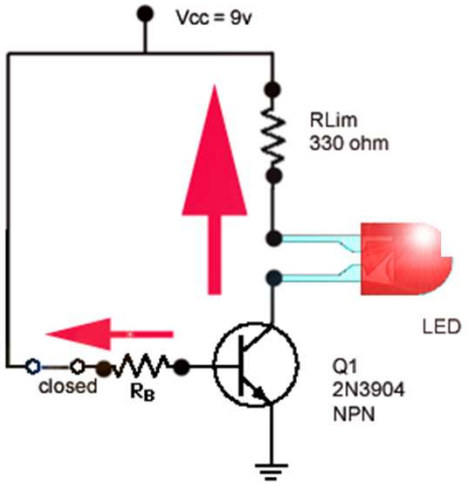
AC	DC
AC changes direction periodically in a waveform.	DC maintains a constant, unidirectional flow of electrons.
AC voltage is easily transformed and is suitable for efficient power distribution over long distances.	DC voltage remains relatively constant, making it less amenable to transformation.
AC power is generated by alternating current generators in power plants for distribution.	DC power is often generated by batteries, fuel cells, and solar cells.
AC is efficient for long-distance transmission with lower energy losses.	DC traditionally faced higher losses over long distances, but HVDC systems improve efficiency for extended transmission.
AC is widely used for household, industrial, and electronic devices.	DC is widely used in low-voltage applications, such as rechargeable and non-rechargeable batteries.

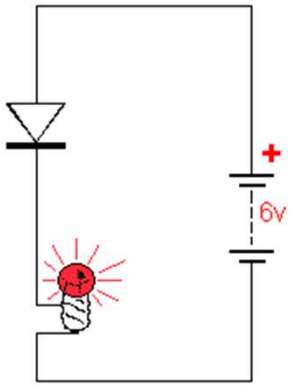
The dangerous values and effects of AC and DC:

The dangerous values and effects of AC and DC:

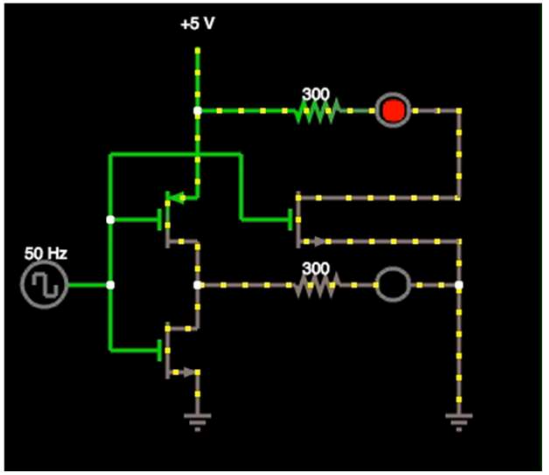
AC 50/60 Hz	DC	Effect
0.4 mA	1 mA	Slight sensation
1-10 mA	5.2-62 mA	Painful sensation
10-16 mA	76 mA	Paralysis of arms, cannot release grip
23-30 mA	90 mA	Respiratory paralysis, obstructive breathing
75-250 mA	500 mA	Ventricular fibrillation, heart starts quivering

Unit- 2: Fundamentals of semiconductor devices





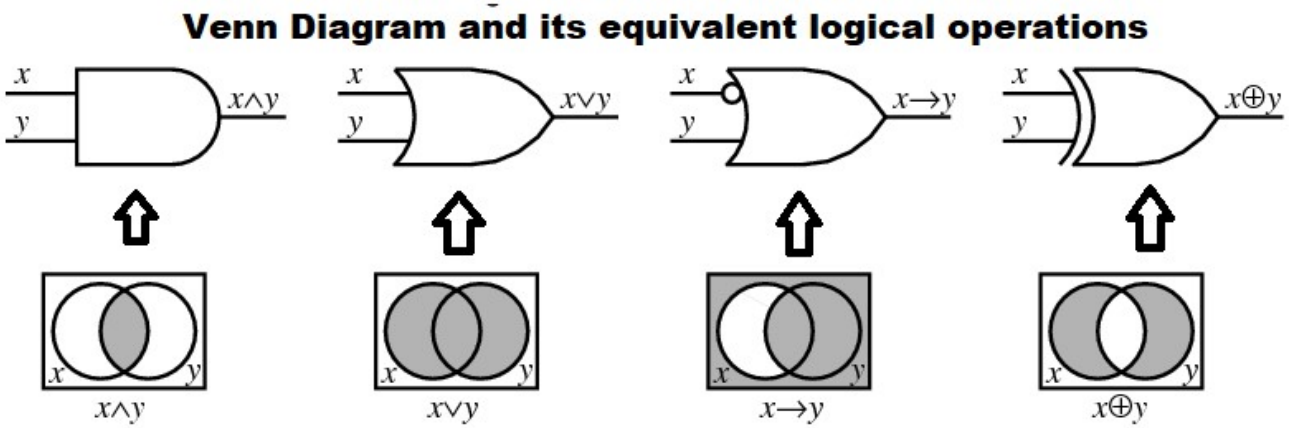
How a diode works

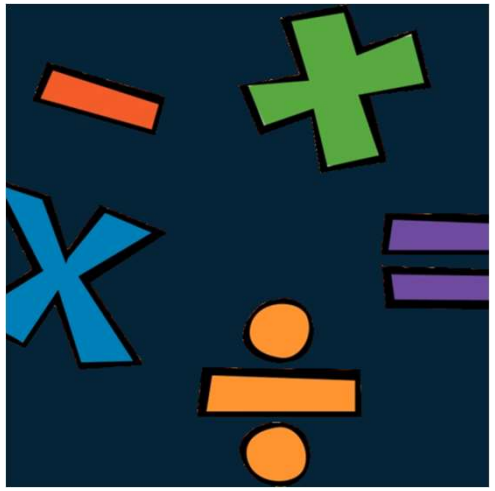


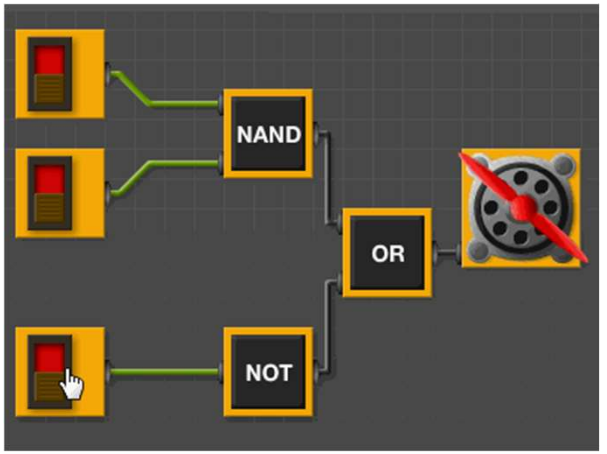
Power supply using diode: mobile charger

MOSFET: Chip Design: Motherboard

Unit- 3: Introduction to number system and logic gates



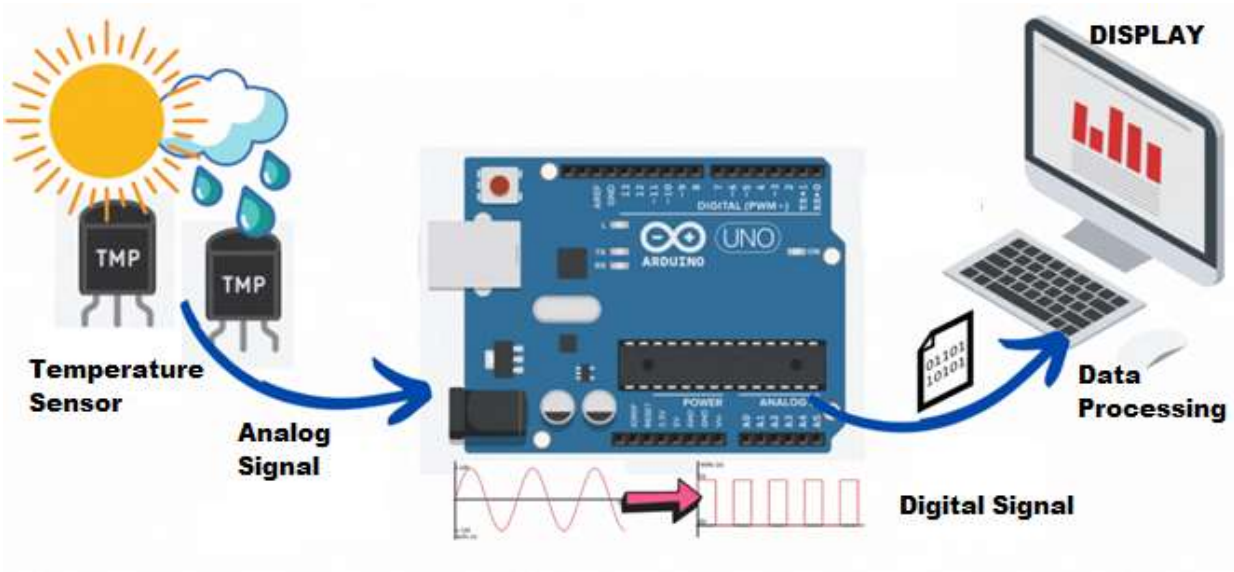


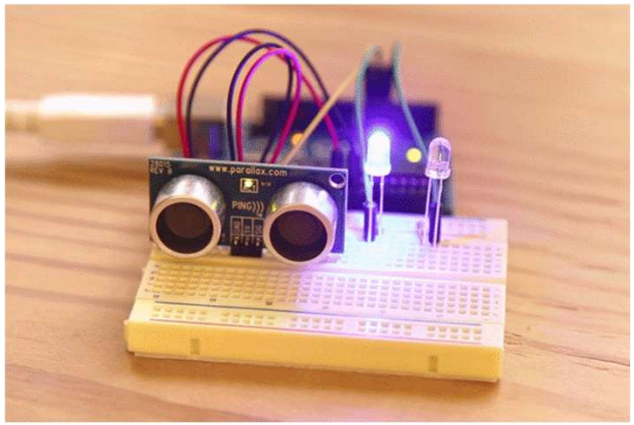


Dec Numbers	Binary Numbers	Octal Numbers	Hexadecimal Numbers
0	0	0	0
1	1	1	1
2		2	2
3		3	3
4		4	4
5		5	5
6		6	6
7		7	7
8			8
9			9
			A
			B
			C
			D
			E
			F

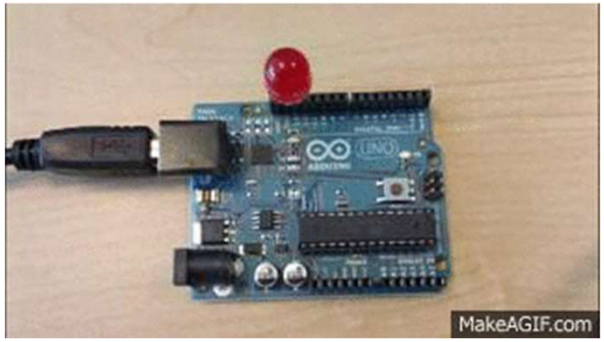
How to create large numbers in any number system????

Unit-4: Introduction of Arduino and Sensors



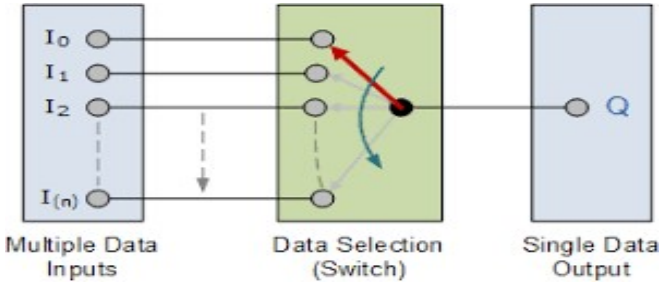


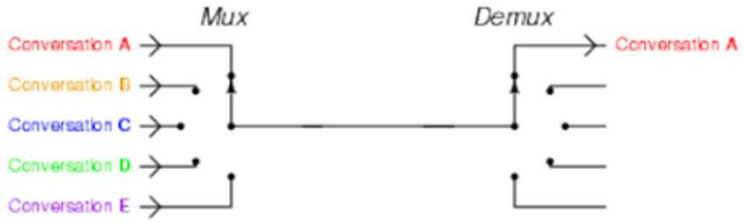
Application using Arduino and Sensors



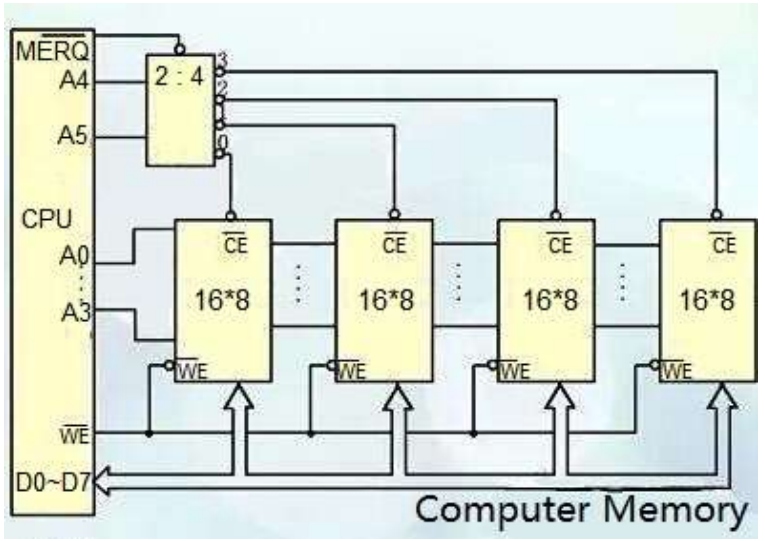
Arduino Blink LED Application

Unit- 5 : Introduction to Combinational Logic Circuits





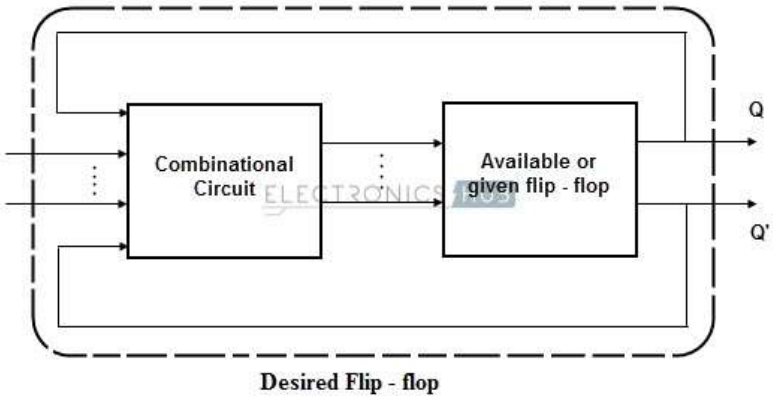
- Design of combinational circuits
- Decoder and encoder operation and function implementation
- Multiplexer and Demultiplexer operation etc.

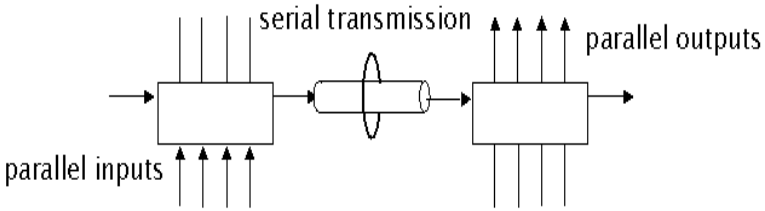


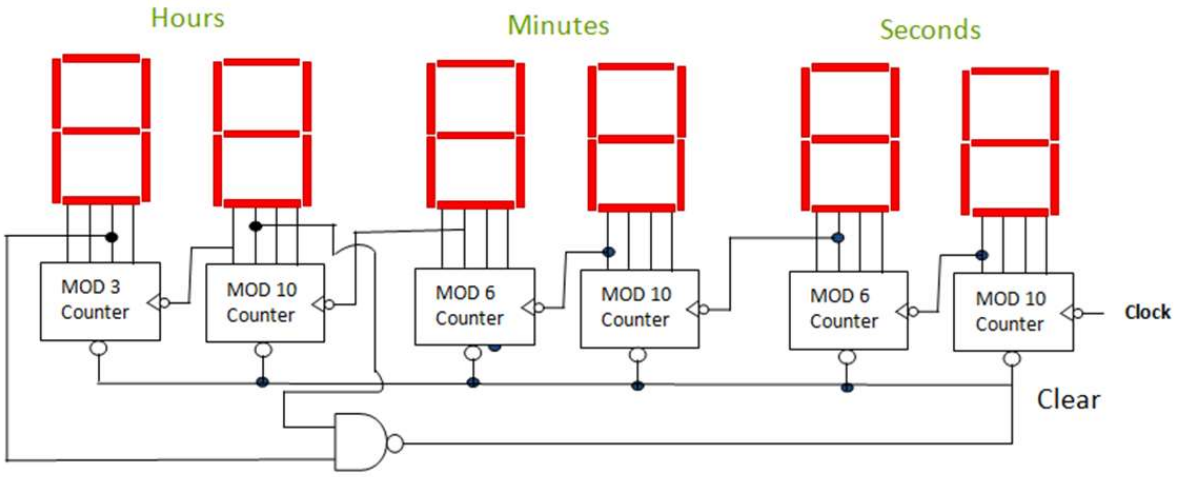
Decoder is used to activate memory chips in a computer to access or load data.

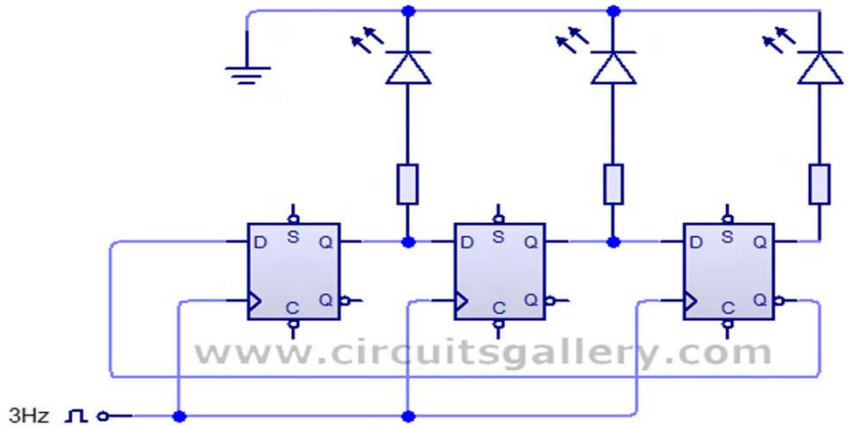
Unit-6: Introduction to Sequential Logic Circuits

- Sequential logic Application
- Multi-bit latches, Registers
- Counters
- Shift register





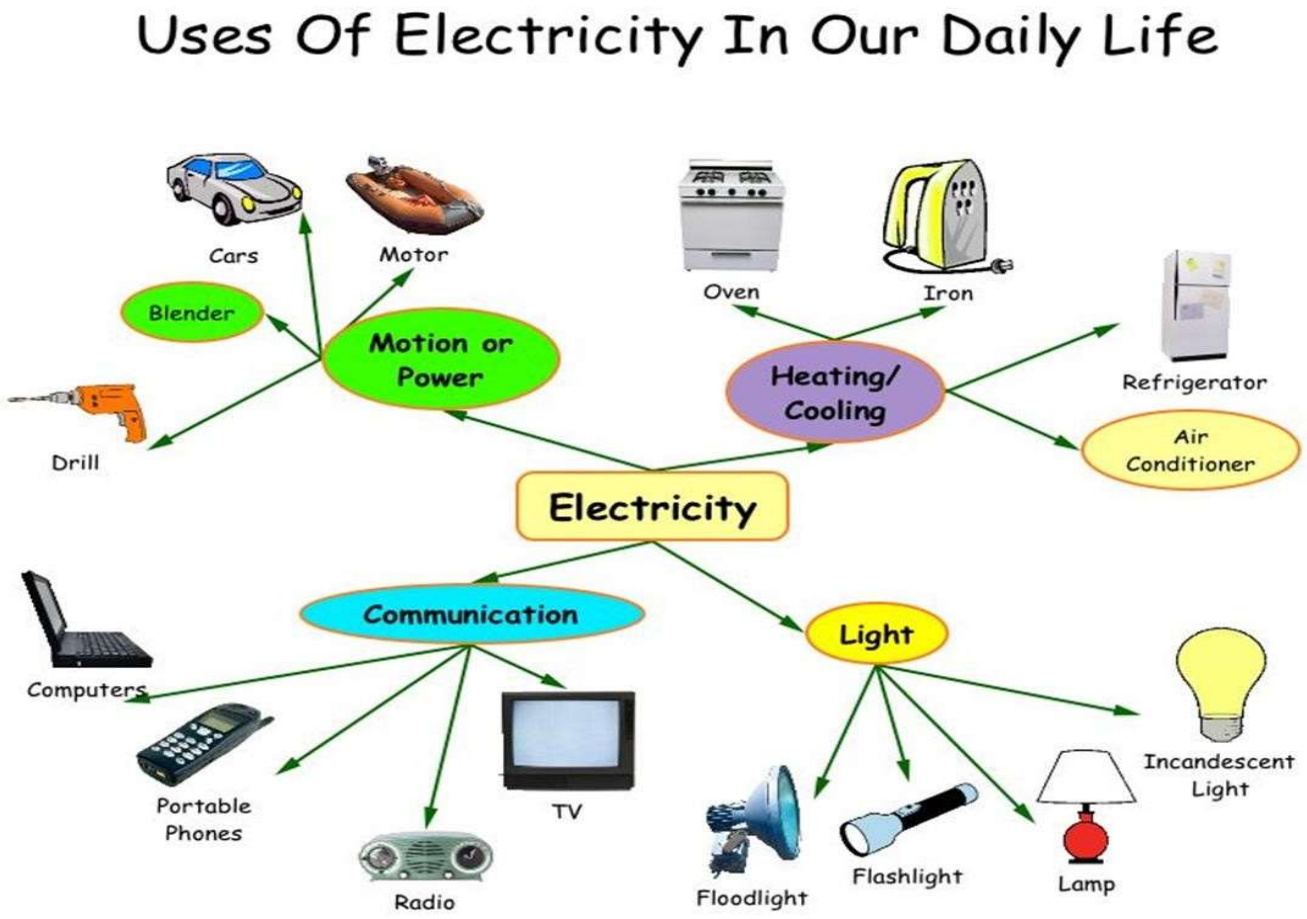




Course Assessment Model

	CA-1	CA-2	CA-3
Marks	30 (12.5 weightage)	30 (12.5 weightage)	30 (12.5 weightage)
Evaluation Procedure	6 Questions of 5 marks each: **Syllabus: Unit 1,2**	Solve 2 questions on circuit simulator, also solve on paper, merge both solutions in one answer book and upload online on UMS	One Arduino based group/individual Project (group size:04 student), ***students from same class group will create project groups***, Project report and viva-10M, Innovation in the project-10M, Working Model-10M **(Plagiarism: Report should be written by the group members only/not copied from online sources)**
Conduct	Allocation of task on UMS:4th Week, Conduct of test :5th Week **(after conduct: retest/ appear on another date /with other group/health etc. not allowed)**	Allocation of task on UMS:10th week, Submission: 11th week: (9:00PM), **(Late submissions due to internet/UMS/health will not be entertained.)**	Allocation of task on UMS:3rd week, Submission: 12th week (tutorial in the same week). Report should be uploaded on UMS by 9:00PM. **Late Report submissions due to issues e.g. internet/ UMS/health will not be entertained.** **Project title submission:** 3rd week Must update progress of Project to the faculty on weekly-basis in tutorial class (1st 5 min), **carelessness will lead to deduction of marks.**
	Test will be conducted in lecture class.	Online uploading on UMS by the students.	Upload report on UMS, and submit hardware project to faculty.
MTE	**40 questions of MCQ type based on unit 1- unit 3 (No direct MCQ questions)**		
ETE	**30 questions of MCQ type based on unit 1- unit 6**		**5 questions, 10 marks each (4 out of 5): Unit-1 to unit 6**

Practical Applications of the Subject

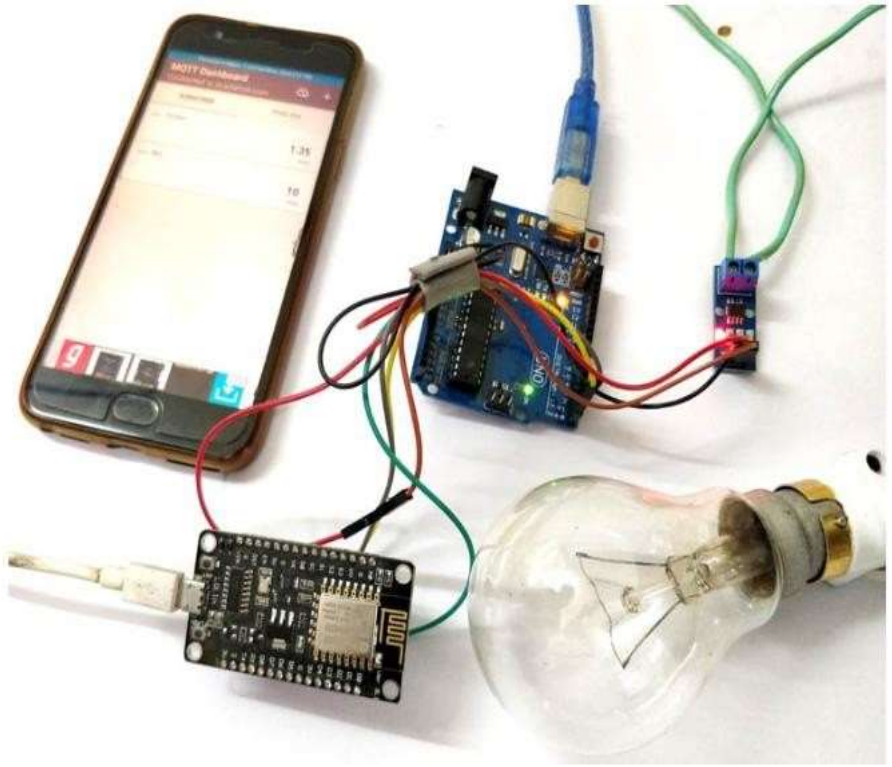


Why ECE Subject for CSE Students?

- Electrical engineers largely deal with hardware, while computer scientists deal with software.
- Electrical engineers are the ones that design circuits, processors, memory, and establishing wireless communication.
- This subject provides the basic understanding regarding the hardware components of the computer.

Hybrid Branches:

- MIT: Department of Electrical Engineering and Computer Science
- UC Berkeley: Electrical Engineering & Computer Sciences

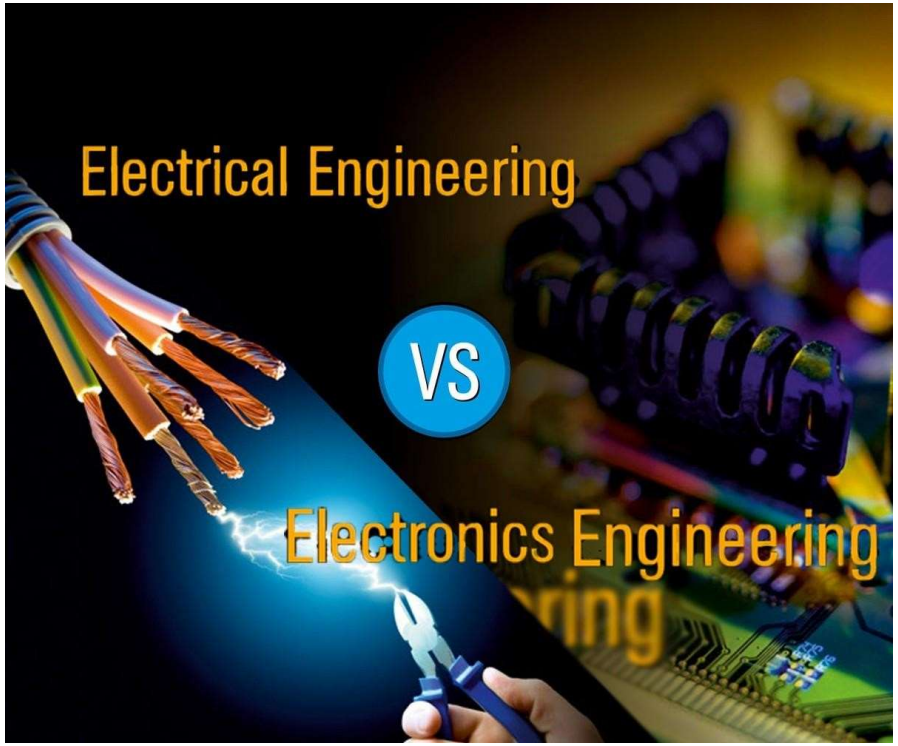


Importance of Electrical Signal in Computers

- AC power
- Power supply
- DC power
- Power distribution inside Computer

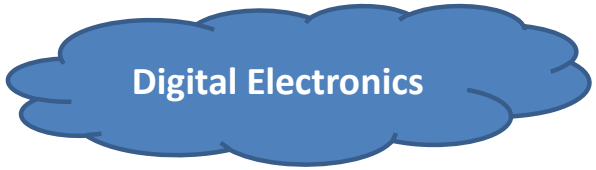
- How to check power failure in any component?
- Identification of reasons for failure/interpretations

ECE 249: Basic Electrical and Electronics Engineering



Electrical vs Electronics

Electrical	Electronics
Deals with larger voltage (typically 220 V, India). Factories and power stations, may require up to 11,000 volts.	Deals with smaller voltage (1.5 V to 12 Volts)
Larger in size	Smaller in size
Example: Motor, transformer, generator	Example: Diode, Transistor, OP-amp, MOSFET



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Blend of Computer Science, Electrical and Electronics

Blend of Computer Science, Electrical and Electronics

- A **washing machine** has an electrical circuit comprising a plug socket, **fuse, on/off switch, and motor,** which rotates the drum.
- The desired wash cycle and temperature are inputted by the user via the control panel.

These instructions are interpreted by **electronic circuits,** which have been designed and **programmed to understand what the user would like based on what buttons have been pressed.**

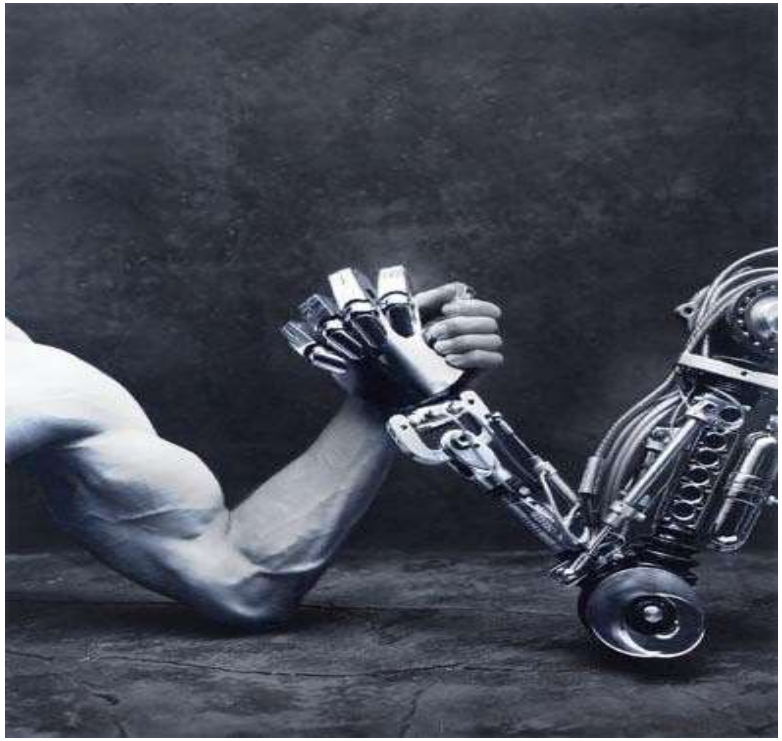
- When the electronic circuit has interpreted these, it sends signals (**commands)** to the electrical circuit to operate the heater and motor, to heat and rotate the drum, for the time required.

Get Set Go!!!

Gear up

Fasten your seat belts

Build futuristic solutions



Any Queries