



1. Material Properties
Mechanical and Physical properties
Properties, Characteristic features of the load extension graph when tensile testing: for different materials, material testing methods

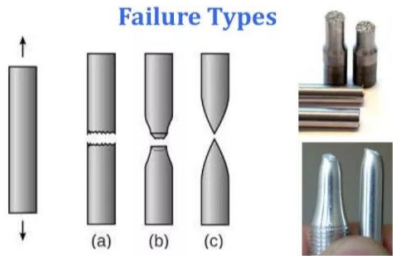


2. Types of materials

- Metals
- Polymers
- Engineering ceramics
- Composite materials
- Modern materials
- Semiconductor materials
- Smart materials

4. Material failure mechanisms and prevention

Failure mechanisms.
Types of corrosion prevention process
Methods to prevent common failure mechanisms from occurring



Mid mocks

3. Effect of processing techniques on material properties
Processing techniques
Metals, Thermoplastic polymers, Thermosetting polymers, Ceramics and composites
Heat treatment:
Ferrous metals, Aluminium alloys



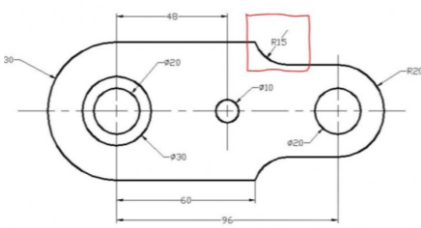
5. Sustainable materials and practices in engineering.

The consequences of not adopting sustainable engineering practices, Concept of the circular economy, finite resources, Designing for efficient use of resources using 6Rs, Methods of identifying and sorting materials for recycling, The use of recycled material in engineering.



Final Examination

Unit – F133-
Computer Aided
Design



1. **Produce 3D models using Computer Aided Design (CAD)**
- Understanding the uses of CAD
 - Creating sketch geometry
 - Solid modelling tools used to create 3D shapes
 - Variations and configurations

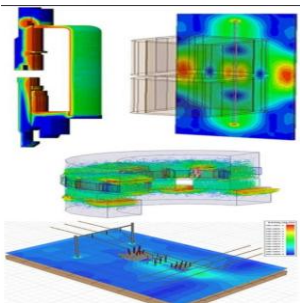
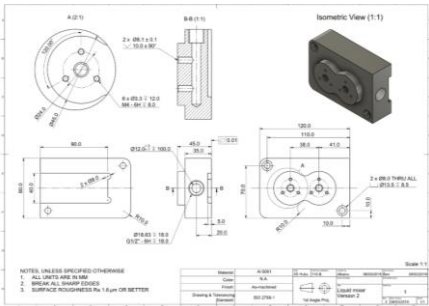


2. **Create a 3D assembly of multiple components within a CAD software**
- Aspects of assembly
 - Presentation of assemblies



NEA unit review

3. **Creating technical drawings from 3D models**
- Drawing standards and conventions
 - How to use projection and units.
 - Apply dimensioning and annotations
 - Assembly drawings

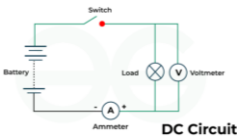


4. **Simulations in 3D modelling**
- Simulations in 3D modelling
 - Setting up and running simulations
 - Analysing results of simulations
 - Engineering principles of design

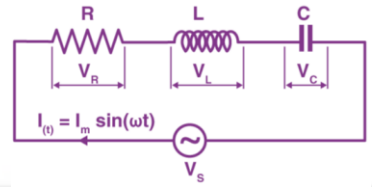


Assessment and Moderation

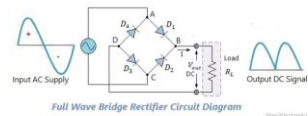
Unit – F137-
Electrical devices
and circuits



- 1. DC circuits**
- Circuit analysis (KCL and KVL)
 - Simulation of circuits using (SPICE) software
 - Building and testing physical circuits
 - Safe working practices



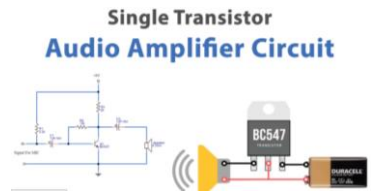
- 2. AC circuits**
- Phasor analysis
 - RL,RC and RLC circuits
 - Reactance and impedance calculations
 - Real, reactive and apparent power
 - Power triangle
 - Resonance and quality factor
 - Power factor and correction



- 3. Diodes**
- Types of Diodes, Characteristics of diode with graphical representation including breakdown voltage, Use of diodes for rectification and regulation.
- Simulation of circuits using SPICE software.
 - Building and testing physical circuits.
 - Safe working practices

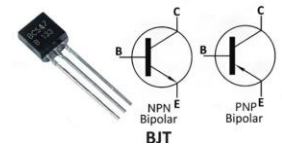
5 Analogue circuits -Transistor based circuits

- Bipolar Junction Transistors**
- Simulation using SPICE software.
 - Building and testing physical CE circuits
 - Theoretical operation of Class A, B, AB and C amplifiers for different application

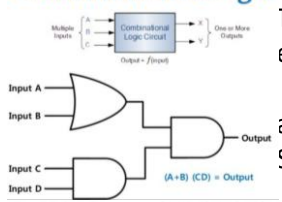


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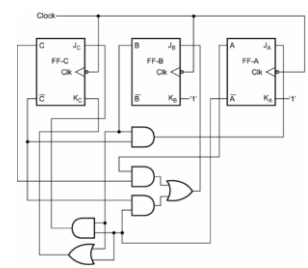
- 4. Transistors**
- NPN formation
 - PNP formation
- Representation of the operating regions, amplification and switching regions of NPN transistors



Combinational Logic



- 6. Digital Circuits- combination circuits**
- Digital circuit representation using Truth Tables, circuit diagram and Boolean expression
- Circuits simplifications using Boolean Laws and identities
- Simulation of circuits using SPICE software
- Building and testing physical circuits
- Safe working practices



- 7. Digital Circuits- Sequential circuits**
- Flip-flops
- Synchronous
 - Asynchronous
- Transition table/diagram
- Sequential circuits design
- Simulation of circuits using SPICE software
- Building and testing physical circuits
- Safe working practices



Assessment and Moderation