Table of Contents

Engineering

Engineering

- Computer-Aided Design and Analysis
- Materials Science and Metallurgy
- Manufacturing and Production Technologies
- Solid Mechanics and Dynamics
- Thermodynamics and Heat Transfer
- Fluid Mechanics
- Electronics, Embedded Systems, and Control

Manufacturing and Production Technologies

Introduction to Manufacturing Technologies Machining (Lathe, Milling, CNC Operations) Casting and Metal Forming (Forging, Rolling, Extrusion) Welding and Joining Technologies Additive Manufacturing (3D Printing, SLA, FDM, SLS) CAM Fundamentals and G-Code Programming

Solid Mechanics and Dynamics

Introduction to Mechanics Statics: Forces, Moments, and Equilibrium Conditions Strength of Materials: Stress, Strain, and Torsion Kinematics: Velocity, Acceleration, and Trajectory Analysis Kinetics: Work, Energy, and Impulse-Momentum Mechanical Vibrations (Free, Forced, Damped)

Thermodynamics and Heat Transfer

Thermodynamic Concepts and Properties 1st and 2nd Laws of Thermodynamics (Enthalpy, Entropy) Power and Refrigeration Cycles (Otto, Diesel, Rankine) Heat Conduction and Fourier's Law Convection and Heat Exchangers Radiation

Fluid Mechanics

Fluid Properties and Viscosity Hydrostatics and Buoyancy Fluid Dynamics: Continuity, Bernoulli, and Energy Equations Internal Flows and Head Loss (Friction Factor) Boundary Layer and Drag/Lift Turbomachinery: Pumps, Fans, and Turbines

Electronics, Embedded Systems, and Control

Basic Circuit Elements (Resistors, Capacitors, Inductors) Circuit Analysis (Ohm's Law, Kirchhoff's Rules) Sensors (Data Reading) and Actuators (Motors, Valves) Microcontrollers (Arduino, STM32, Raspberry Pi) Communication Protocols (I2C, SPI, UART, CAN Bus) PID Control and Automation

Systems

The information in this document is cited from UCH Wiki.