

Syllabus - (Engineering) (Tea Processing & Manufacturing)

Description	Marks
<p>Section 1: Applied Mechanics and Design Engineering Mechanics: Force systems, equilibrium, centroid, moment of inertia, friction, kinematics and dynamics of rigid bodies, impulse and momentum, and energy formulations. Mechanics of Materials: Stress and strain, bending and shear stresses, deflection of beams, torsion of shafts, thermal stresses, testing of materials. Theory of Machines: Cams, gears, balancing, flywheels, governors. Machine Design: Static and dynamic loading, fatigue strength, design of machine elements including shafts, gears, bearings, and joints.</p>	75
<p>Section 2: Fluid Mechanics and Thermal Sciences Fluid Mechanics: Fluid properties, statics, Bernoulli's equation, laminar and turbulent flow, flow through pipes and channels. Thermodynamics: Laws of thermodynamics, properties of gases and vapours, cycles (Otto, Diesel), IC engines, compressors, and turbines. Heat Transfer: Conduction, convection, radiation, and heat exchangers. Applications in power generation, refrigeration, and air conditioning systems relevant to mechanical and farm machinery operations.</p>	75
<p>Section 3: Materials, Manufacturing and Industrial Engineering Engineering Materials: Structure, properties, and heat treatment of metals and alloys. Manufacturing Processes: Casting, forming, welding, and machining principles. Metrology and Inspection: Limits, fits, tolerances, and measurement tools. CNC and CAD/CAM integration, additive manufacturing, and workshop practices for farm machinery. Production Planning and Operations: Basic scheduling, inventory control, and lean practices.</p>	75
<p>Unit 4: Machinery Design and equipment (specially for agriculture sector) Design and selection of mechanical elements: gears, pulleys, bearings, couplings, and springs. machinery systems: design principles, Power transmission, force analysis, stability, and balancing of machines. Application of hydraulics, pneumatics, and mechatronics in machine design.</p>	75
<p>Unit 5: Power and Engine Systems Fundamentals of IC engines, power cycles, and thermodynamic efficiency. Engine systems: fuel injection, cooling, lubrication, transmission, and controls. mechanics, power take-off systems, differential and chassis design. Emission control, performance evaluation, and maintenance of engines for mechanical and farm use.</p>	75
<p>Unit 6: Ergonomics and Safety in Machinery Operation Human factors in design: anthropometry, fatigue, comfort, and visual ergonomics. Safety aspects in mechanical and agricultural machinery. Noise and vibration control, chemical hazard management, and operator safety gear. Ergonomic, controls, and interfaces.</p>	75
<p>Unit 7: Manufacturing Technology and Workshop Practices Ferrous, non-ferrous, and composite materials: selection for mechanical and farm applications. Machining and joining techniques, welding, die-casting, and prototype production. Workshop layout, planning, and testing of fabricated components. Maintenance practices and material testing for agricultural equipment.</p>	75

Unit 8: Instrumentation, Control, and Automation

Measurement of mechanical variables (pressure, strain, torque, temperature, vibration). Sensors, transducers, and data acquisition systems for machine diagnostics. Control systems in processing and agricultural machinery. AI, IoT, and Machine Learning applications for predictive maintenance and automation in agriculture equipment.

Unit 9: Basic Electronics

Semiconductor & Diode Basics (PN junctions, rectifiers, filters, voltage regulation), Transistors & Op-Amps, Sensors & Transducers (Strain gauge, thermistor, thermocouple, LVDT; pressure, flow, speed, vibration sensors), Instrumentation & Signal Conditioning, Control & Actuation in Mechanical Systems (Open/closed-loop control; DC/stepper/servo motors; drivers; PLC/microcontroller interface; mechatronics applications).

Unit 10: Introduction to Tea Machinery

Types of tea machinery: leaf handling, withering, rolling/CTC, fermentation, drying, sorting, packaging, Factory layout, workflow, and safety standards.

Green Leaf Handling (Leaf receiving docks, conveyors, weighing systems, Conveyor types: belt, bucket, vibratory),

Withering Machinery (Withering troughs: conventional, forced draft, continuous, Fans and airflow systems, Sensors: temperature, humidity; VFD controllers, Automation in withering)

Orthodox rollers: components & operation, Rotorvane machines: rotor, stator, vanes, CTC machines: cutters, rollers, pressure systems

Continuous fermenting machines (CFM)

Dryer types: Fluid Bed Dryer (FBD), ECPD, Vibro-fluidized dryers, continuous dryers

Vibratory & rotary sifters, mesh systems, Fibre extractors, winnowers, cyclone separators

PLC, SCADA, IoT-based monitoring, Safety interlocks.

Unit 10: General Studies

General Reasoning, General English, General Awareness, Innovative Knowledge

25

Total

100