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Tick one box per statement: ☐ not yet    ☐ nearly    ☐ confident.

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## 1. Engineering Mechanics – Statics

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### 1.1 Vectors and forces

☐☐☐ Vectors and forces

### 1.2 Free-body diagrams

☐☐☐ Free-body diagrams

### 1.3 Particle equilibrium

☐☐☐ Particle equilibrium

### 1.4 Moments and couples

☐☐☐ Moments and couples

### 1.5 Rigid-body equilibrium and supports

☐☐☐ Rigid-body equilibrium and supports

### 1.6 Structures – trusses and frames

☐☐☐ Structures – trusses and frames

### 1.7 Friction

☐☐☐ Friction

### 1.8 Centroids and distributed loads

☐☐☐ Centroids and distributed loads

## 2. Mathematical Methods for ME

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### 2.1 Calculus for engineering

☐☐☐ Calculus for engineering

### 2.2 Linear algebra

☐☐☐ Linear algebra

### 2.3 Differential equations

☐☐☐ Differential equations

### 2.4 Numerical methods

☐☐☐ Numerical methods

## 2.5 Vector calculus

☐☐☐ Vector calculus

## 2.6 Probability and uncertainty

☐☐☐ Probability and uncertainty

# 3. Engineering Mechanics – Dynamics

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## 3.1 Particle kinematics

☐☐☐ Particle kinematics

## 3.2 Particle kinetics (Newton) ( )

☐☐☐ Particle kinetics (Newton)

## 3.3 Work and energy

☐☐☐ Work and energy

## 3.4 Impulse and momentum

☐☐☐ Impulse and momentum

## 3.5 Rigid-body kinematics

☐☐☐ Rigid-body kinematics

## 3.6 Rigid-body kinetics

☐☐☐ Rigid-body kinetics

# 4. Engineering Materials

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## 4.1 Structure and bonding

☐☐☐ Structure and bonding

## 4.2 Stress-strain and elastic behaviour -

☐☐☐ Stress-strain and elastic behaviour

## 4.3 Metals and alloys

☐☐☐ Metals and alloys

## 4.4 Polymers, ceramics and composites ,

☐☐☐ Polymers, ceramics and composites

## 4.5 Processing and property links

☐☐☐ Processing and property links

## 4.6 Failure and material selection

☐☐☐ Failure and material selection

## 5. Thermodynamics

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### 5.1 Properties and state

☐☐☐ Properties and state

### 5.2 First law for closed systems

☐☐☐ First law for closed systems

### 5.3 First law for open systems

☐☐☐ First law for open systems

### 5.4 Second law and entropy

☐☐☐ Second law and entropy

### 5.5 Power cycles

☐☐☐ Power cycles

### 5.6 Refrigeration and heat pumps

☐☐☐ Refrigeration and heat pumps

## 6. Mechanics of Materials

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### 6.1 Axial loading

☐☐☐ Axial loading

### 6.2 Torsion

☐☐☐ Torsion

### 6.3 Shear and bending

☐☐☐ Shear and bending

### 6.4 Beam stresses and deflection

☐☐☐ Beam stresses and deflection

### 6.5 Combined stress and Mohr's circle

☐☐☐ Combined stress and Mohr's circle

### 6.6 Buckling and failure criteria

☐☐☐ Buckling and failure criteria

## 7. Fluid Mechanics

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### 7.1 Fluid properties and statics

☐☐☐ Fluid properties and statics

### 7.2 Conservation and control volumes

☐☐☐ Conservation and control volumes

### 7.3 Bernoulli and flow measurement

☐☐☐ Bernoulli and flow measurement

### 7.4 Dimensional analysis

☐☐☐ Dimensional analysis

### 7.5 Pipe flow and losses

☐☐☐ Pipe flow and losses

### 7.6 External flow

☐☐☐ External flow

## 8. Manufacturing Processes

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### 8.1 Engineering drawings and tolerances

☐☐☐ Engineering drawings and tolerances

### 8.2 Casting and forming

☐☐☐ Casting and forming

### 8.3 Machining

☐☐☐ Machining

### 8.4 Joining

☐☐☐ Joining

### 8.5 Additive manufacturing

☐☐☐ Additive manufacturing

### 8.6 Process planning and quality

☐☐☐ Process planning and quality

## 9. Machine Design

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### 9.1 Design communication and CAD

☐☐☐ Design communication and CAD

### 9.2 Load paths and design safety

☐☐☐ Load paths and design safety

### 9.3 Static and fatigue criteria

☐☐☐ Static and fatigue criteria

### 9.4 Shafts and bearings

☐☐☐ Shafts and bearings

### 9.5 Joints and gears

☐☐☐ Joints and gears

### 9.6 Constrained design project

☐☐☐ Constrained design project

## 10. Heat Transfer

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### 10.1 Conduction

☐☐☐ Conduction

### 10.2 Transient conduction

☐☐☐ Transient conduction

### 10.3 Convection

☐☐☐ Convection

### 10.4 Radiation

☐☐☐ Radiation

### 10.5 Heat exchangers

☐☐☐ Heat exchangers

### 10.6 Thermal design

☐☐☐ Thermal design

## 11. Theory of Machines and Vibrations

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### 11.1 Mechanisms and kinematic pairs

☐☐☐ Mechanisms and kinematic pairs

### 11.2 Velocity and acceleration analysis

☐☐☐ Velocity and acceleration analysis

### 11.3 Balancing

☐☐☐ Balancing

### 11.4 Free vibration

☐☐☐ Free vibration

### 11.5 Forced vibration

☐☐☐ Forced vibration

### 11.6 Multi-degree-of-freedom systems

☐☐☐ Multi-degree-of-freedom systems

## 12. System Dynamics and Control

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### 12.1 Lumped-parameter modelling

☐☐☐ Lumped-parameter modelling

### 12.2 Electromechanical systems

☐☐☐ Electromechanical systems

### 12.3 Transfer functions and response

☐☐☐ Transfer functions and response

### 12.4 Feedback and PID control

PID

☐☐☐ Feedback and PID control

### 12.5 Digital implementation

☐☐☐ Digital implementation

### 12.6 Sensors and actuators

☐☐☐ Sensors and actuators

### 12.7 Mechatronics project

☐☐☐ Mechatronics project