# Bundled Education Solutions For Engineering Fundamentals

## KIT6 EFK6 Engineering Fundamentals Complete Kit

Contains all of the Engineering Fundamentals kits, plus Ten Base Units.
**Includes the following experiment trays:**

| EFK6 Engineering Fundamentals Complete Kit | Code | Qty |
|---|---|---|
| Engineering Fundamentals Base Unit | EF-BU | 10 |
| Engineering Fundamentals Spares | EF1-SPARES | 1 |
| Engineering Fundamentals Single Tray with Lid | EF-ST | 2 |
| Engineering Fundamentals Work Station 18 slots | EF-WS-18 | 2 |
| Engineering Fundamentals Forces | EF-1.1 | 1 |
| Engineering Fundamentals Moments | EF-1.2 | 1 |
| Engineering Fundamentals Beams | EF-1.3a | 1 |
| Engineering Fundamentals Trusses | EF-1.3b | 1 |
| Engineering Fundamentals Springs | EF-1.4 | 1 |
| Engineering Fundamentals Torsion | EF-1.5 | 1 |
| Engineering Fundamentals Friction | EF-2.1 | 1 |
| Engineering Fundamentals Simple Harmonic Motion | EF-2.2 | 1 |
| Engineering Fundamentals Rotational Friction | EF-2.3 | 1 |
| Engineering Fundamentals Potential and Kinetic Energy | EF-2.4 | 1 |
| Engineering Fundamentals Centrifugal and Centripetal Force | EF-2.5 | 1 |
| Engineering Fundamentals Cam, Crank and Toggle | EF-3.1 | 1 |
| Engineering Fundamentals Simple Mechanisms | EF-3.2 | 1 |
| Engineering Fundamentals Additional Mechanisms | EF-3.3 | 1 |
| Engineering Fundamentals Bar Linkages | EF-3.4 | 1 |
| Engineering Fundamentals Pulley's | EF-4.1 | 1 |
| Engineering Fundamentals Gear's | EF-4.2 | 1 |
| Engineering Fundamentals Drive Systems | EF-4.3 | 1 |
| Engineering Fundamentals Tensile Tester | EF-5.1 | 1 |

| EFK1 Forces and Moments Kit | Code | Qty |
|---|---|---|
| Engineering Fundamentals Base Unit | EF-BU | 2 |
| Engineering Fundamentals Forces | EF-1.1 | 1 |
| Engineering Fundamentals Moments | EF-1.2 | 1 |

Contains one of each of the Forces and Moments Kits, plus two Base Units.

| EFK2 Materials Testing Kit | Code | Qty |
|---|---|---|
| Engineering Fundamentals Base Unit | EF-BU | 4 |
| Engineering Fundamentals Beams | EF-1.3a | 1 |
| Engineering Fundamentals Springs | EF-1.4 | 1 |
| Engineering Fundamentals Torsion | EF-1.5 | 1 |
| Engineering Fundamentals Tensile Tester | EF-5.1 | 1 |

Contains one of each of the Deflection of Beams, Springs, Torsion and Tensile Tester Kits, plus four Base Units.

| EFK3 Simple Machines Kit | Code | Qty |
|---|---|---|
| Engineering Fundamentals Base Unit | EF-BU | 4 |
| Engineering Fundamentals Centrifugal and Centripetal Force | EF-2.5 | 1 |
| Engineering Fundamentals Pulley's | EF-4.1 | 1 |
| Engineering Fundamentals Gear's | EF-4.2 | 1 |
| Engineering Fundamentals Drive Systems | EF-4.3 | 1 |

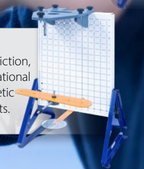
Contains one of each of the Centrifugal Force, Pulleys, Gears and Drive Systems Kits, plus four Base Units.

| EFK4 Mechanisms Kit | Code | Qty |
|---|---|---|
| Engineering Fundamentals Base Unit | EF-BU | 4 |
| Engineering Fundamentals Cam, Crank and Toggle | EF-3.1 | 1 |
| Engineering Fundamentals Simple Mechanisms | EF-3.2 | 1 |
| Engineering Fundamentals Additional Mechanisms | EF-3.3 | 1 |
| Engineering Fundamentals Bar Linkages | EF-3.4 | 1 |

Contains one of each of the Cam, Crank and Toggle, Simple Mechanisms, Additional Mechanisms and Bar Linkages Kits, plus four Base Units.

| EFK5 Vibration, Friction & Energy | Code | Qty |
|---|---|---|
| Engineering Fundamentals Base Unit | EF-BU | 4 |
| Engineering Fundamentals Friction | EF-2.1 | 1 |
| Engineering Fundamentals Simple Harmonic Motion | EF-2.2 | 1 |
| Engineering Fundamentals Rotational Friction | EF-2.3 | 1 |
| Engineering Fundamentals Potential and Kinetic Energy | EF-2.4 | 1 |

Contains one of each of the Friction, Simple Harmonic Motion, Rotational Friction and Potential and Kinetic Energy Kits, plus four Base Units.





## Knowledge base

> 28 years expertise in research & development technology
> 50 years providing engaging engineering teaching equipment

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Engineering Fundamentals - EF Series

EF SERIES

# Engineering Fundamental Kits

## Part of a comprehensive range of engineering topic trainers

The Engineering Fundamentals range is designed to enable students to gain an understanding of the fundamentals of engineering by the process of learning via hands-on experimentation.

The modular hands-on tray-based system is supplied in conjunction with a multifunctional Base Unit enabling the student to conduct their own experiments in subjects such as Statics, Dynamics, Mechanisms, Kinematics, and Strength of Materials.

Each kit is supplied with a highly visual user-friendly operational guide, enabling the student to understand the theory of the subject by the application of practical experimentation.

## Bundled Learning For:

- STEM Education
- National Vocational Qualifications
- High Schools & Technical Colleges
- University Foundation Degrees

EF Series Link

UK office - email: sales@armfield.co.uk tel: +44 (0) 1425 478781 (for ROW)
USA office - email: info@armfield.inc tel: +1 (609) 208-2800 (USA only)

Issue: 1
URL: http://www.armfield.co.uk/ef

Applications
ME ChE CE IP

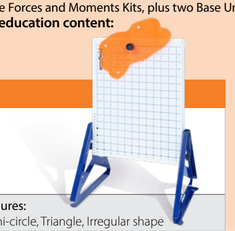


armfield.co.uk

## KIT1 EFK1 FORCES AND MOMENTS KITS

Contains one of each of the Forces and Moments Kits, plus two Base Units.
**Includes the following education content:**

### EF-1.1 Forces



- Centre of gravity of plane figures: Parallelogram, Rectangle, Semi-circle, Triangle, Irregular shape
- **Analysis of 3 forces in equilibrium using:** Force triangles, Vector addition, Bow's notation, Graphical method, Mathematical solution
- **Analysis of 4 forces in equilibrium using:** Force triangles, Vector addition, Bow's notation, Graphical method, Mathematical solution
- Analysis of non-concurrent forces (Linked polygons)

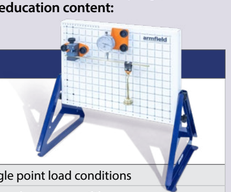
### EF-1.2 Moments

- Simple Beam Balance
- Beam Balance with Oblique Force
- 1st Class Lever / 2nd Class Lever / 3rd Class Lever
- Bell Crank Lever
- Beam Reactions
- Stability of a Body

## KIT2 EFK2 MATERIALS TESTING KIT

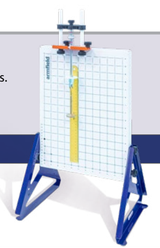
Contains one of each of the Deflection of Beams, Springs, Torsion and Tensile Tester Kits, plus four Base Units.
**Includes the following education content:**

### EF-1.3a Beams



- Analysis of beams under single point load conditions
- Analysis of beams under two point load conditions
- Analysis of cantilever beams under single point load conditions
- Analysis of beams under uniformly distributed load conditions
- Shearing

### EF-1.4 Springs



- Hooke's law applied to compression springs, single spring
- Hooke's law applied to compression springs in series
- Hooke's law applied to compression springs in parallel
- Hooke's law applied to extension springs, single spring
- Hooke's law applied to extension springs in series
- Hooke's law applied to extension springs in parallel

### EF-1.5 Torsion

- Effect of rod length, rod material (Modulus of Rigidity) and 'J' value on angle of twist

### EF-5.1 Tensile Tester

- Tensile tests (to destruction) of different materials
- Finding the tensile strength of a material
- Material behaviour in the elastic and plastic region
- Creating a force and extension chart

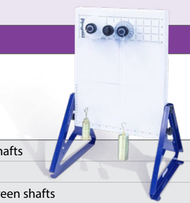
## KIT3 EFK3 SIMPLE MACHINES KIT

Contains one of each of the Centrifugal and Centripetal Force, Pulleys, Gears and Drive Systems Kits, plus four Base Units.
**Includes the following education content:**

### EF-2.5 Centrifugal & Centripetal Force

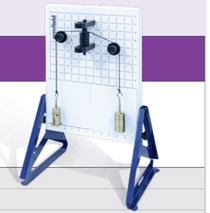
- Centrifugal & Centripetal Force
- Relationship Between Centripetal Force, radius and Velocity of Different Rotating Masses

### EF-4.2 Gear's



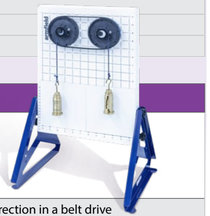
- Bevel gear – perpendicular shafts
- Spur gear – parallel shafts
- Transmission of motion between shafts
- The advantages and disadvantages of different gears
- Introduction to gear ratio, velocity ratio, efficiency of gears and mechanical advantage
- Worm gear – perpendicular overlapping shafts
- Rack and pinion – convert circular motion to linear motion
- Characteristics of spur gears, including single and compound gear trains and the 'idler' gear
- Gear terminology such as pitch diameter, number of teeth & centre distance

### EF-4.1 Pulley's



- Weston differential pulley
- Windlass/wheel and axle
- Compound pulleys
- Moveable pulleys
- Fixed pulleys
- Capstan

### EF-4.3 Drive Systems



- Power transfer, efficiency and direction in a belt drive
- Power transfer and efficiency in a chain drive
- Input and output relationships of a universal coupling
- Friction and angle of lap on a pulley

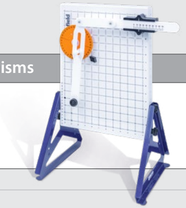
## KIT4 EFK4 MECHANISMS KIT

Contains one of each of the Cam, Crank and Toggle, Simple Mechanisms, Additional Mechanisms and Bar Linkages Kits, plus four Base Units. **Includes the following education content:**

### EF-3.1 Cam, Crank and Toggle

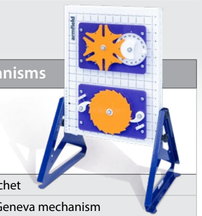
- Relationship between the angular movement of a pear, heart, round and snail cam and the linear movement of the follower
- Characteristics of a pear, heart, round, and snail cam profile
- Show characteristics of a rotating crank assembly by observing the motion of the system and observe the change in turning moment with crank angular position
- Turning moments and forces during crank motion

### EF-3.2 Simple Mechanisms



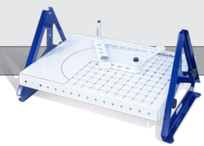
- Crank & slider
- Four bar linkage
- Oscillating cylinder
- Scotch yoke
- Slotted link quick return mechanism
- Whitworth quick return mechanism

### EF-3.3 Additional Mechanisms



- Conversion of motion using a ratchet
- Conversion of motion using the Geneva mechanism

### EF-3.4 Bar Linkages



- **Four-bar linkages:** Crank rocker, double rocker, drag link and parallelogram
- **Straight line linkages:** Watt's straight line, Chebyshev, Peaucellier-Lipkin, Hart's inversor, Robert's and Hoeken's
- Pantograph
- Ackermann steering

## KIT5 EFK5 VIBRATION, FRICTION AND ENERGY

Contains one of each of the Friction, Simple Harmonic Motion, Rotational Friction and Potential and Kinetic Energy Kits, plus four Base Units. **Includes the following education content:**

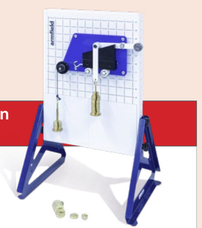
### EF-2.1 Friction

- Static and kinetic Friction
- Sliding and Rolling Friction
- Effect of Angle on Friction
- Component Forces
- Calculating the coefficient for both kinetic and static friction

### EF-2.2 Simple Harmonic Motion (SHM)

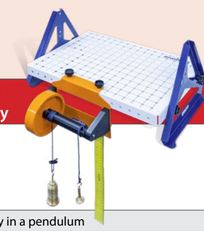
- Effect of length and mass on period of oscillation of a simple pendulum
- Effect of length and mass on period of oscillation bifilar pendulum
- Effect of length and mass on period of oscillation trifilar pendulum
- Effect of length and mass on period of oscillation compound pendulum
- Measuring gravity using kater's pendulum
- Simple Harmonic Motion of a spring-mass system

### EF-2.3 Rotational Friction



- Efficiency of a screw jack
- Efficiency of a wedge
- Efficiency of different bearings
- Mechanical advantage
- Velocity ratio
- Efficiency / 'Overhaul'

### EF-2.4 Potential and Kinetic Energy



- Kinetic and potential energy in a pendulum
- Elastic (Potential) energy in a Spring
- Kinetic Energy in a Flywheel
- Energy Transfers
- Overcoming loses

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