

# **CoDA Curriculum – Design + Innovation Engineering Manufacture (OCR Cambridge National Certificate)**



*Improving the life chances of all students*

|     | Autumn 1                                                                                                                                                                                                                                                                                                                                                                                                                    | Autumn 2                                                                                                                                                                                                                                                                                                                                            | Spring 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Spring 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Summer 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Summer 2                                                                                                                                                                                                                                                                                            |
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| Y10 | <p>Mechanical properties of materials<br/>Difference between pure metals and alloys</p> <p>Types of ferrous metal: cast iron, low carbon steel, high carbon steel, stainless steel</p> <p>1.2 Details of different manufacturing processes</p> <p>Forming Processes - Forging / Press forming</p> <p>Interpret an engineering drawing and prepare a production plan</p>                                                     | <p>Carry out a risk assessment</p> <p>Select and safely use equipment for marking out</p> <p>Select and use measuring instruments</p> <p>Manually controlled machining operations - Drilling, Turning using a centre lathe, Milling</p> <p>Tools and equipment - hacksaw, junior hacksaw, Guillotine, Files, Tap and die, Press (sheet bending)</p> | Marking out, Manually controlled processes, Joining Techniques                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | NEA - R015 – Plan, Risk Assessment, Marking out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <p>NEA - R015 –Marking out, manually controlled processes, Joining Techniques.</p> <p>Manufacture and use of templates, jigs, Go-no go gauges.</p> <p>Fusion 360 Refresh</p>                                                                                                                                                                                                                                                                                                                                                                                                                           | <p>Safely use processes and equipment to make products in quantity</p> <p>Setting up of CNC equipment – Tooling, Work holding, Setting datum points, Safety procedures</p> <p>Operating CNC equipment, Operate CNC equipment safely</p> <p>Apply quality control methods for volume manufacture</p> |
|     | Phone Stand                                                                                                                                                                                                                                                                                                                                                                                                                 | FPT – Nylon Holder<br>Spinning top                                                                                                                                                                                                                                                                                                                  | Spinning top                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | NEA - R015 - Practical                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | NEA - R015 - Practical<br><b>NEA – R015 – Deadline + Submission</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | R016 - Phone holder Sample assessment as a task                                                                                                                                                                                                                                                     |
| Y11 | <p>Types of Polymers and how they are processed. Difference between thermoplastic and thermosetting polymers.</p> <p>Types of thermoplastic polymer: Acrylonitrile-Butadiene-Styrene (ABS), High Impact Polystyrene (HIPS), Polymethylmethacrylate (PMMA/Acrylic), Polycarbonate, Polylactic acid (PLA).</p> <p>Types of thermosetting polymer: urea formaldehyde, melamine formaldehyde, epoxy resin, polyester resin.</p> |                                                                                                                                                                                                                                                                                                                                                     | <p>Influence of the scale of manufacture on the production method. Scales of manufacture; one-off, batch, mass. Advantages and limitations of jigs, fixtures, templates and moulds . Level of automation; manual control, CAM processes, fully automated robotic control. Advantages and limitations of using CAM machines to manufacture parts.</p> <p>Quality. Reasons for implementing a quality system in engineering; early intercept of problems in production, reducing waste and associated costs, consistency of finished products, conformity to industry standards and regulations, reduce issues at customer and returns. Quality control as a reactive approach, measuring parts. Quality assurance as a preventative approach putting in place systems to reduce occurrence of defects</p> | <p>Inventory management, Just in time (JIT) manufacturing, Material requirements planning (MRP)</p> <p>Lean manufacturing. The seven categories of waste; transportation, inventory, movement, waiting, over-processing, over-production, defects. How reducing each waste improves the performance of manufacturing.</p> <p>Globalisation. Requirement for transportation. International standards. Influence on employment opportunities. Differences in employment conditions. Influence on product cost. Implications for sustainability. Consideration of economic, social, ethical and environmental implications.</p> | <p>Types of Ceramics and how they are processed. Types of engineering ceramic: silicon carbide, tungsten carbide, silicate glass. Types of Composite materials and how they are processed. Difference between metal alloys and composite materials.</p> <p>Types of composite material; glass reinforced polymer (GRP/fibreglass), carbon reinforced polymer (CRP)</p> <p>Types of Smart materials and how they are processed. Definition of a smart material. Types of smart material; shape memory alloy (SMA), thermochromic pigment, photochromic pigment, Quantum Tunnelling Composite (QTC).</p> |                                                                                                                                                                                                                                                                                                     |
|     | <b>NEA – R015 – Deadline + Submission</b>                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>EXAM - R014 End of term</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                     |