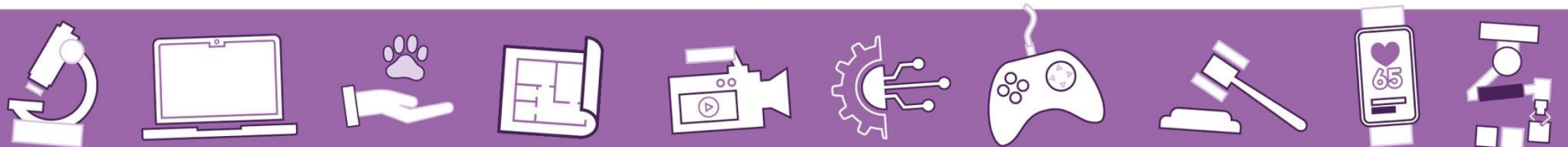




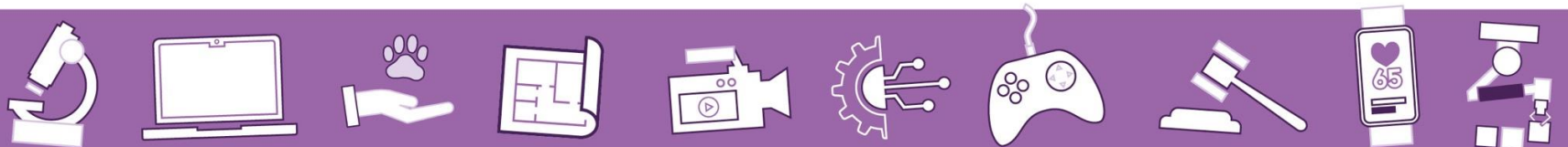
**1 Working within the engineering and manufacturing sectors**

Criteria	Range	Resource identified
1.1 Key principles and methodologies in engineering and manufacturing design.	Types of manufacturing process (wasting, forming, shaping, joining, finishing, additive)	<a href="https://www.bbc.co.uk/bitesize/guides/zvstng8/revision/4">https://www.bbc.co.uk/bitesize/guides/zvstng8/revision/4</a>  <a href="https://www.bbc.co.uk/bitesize/guides/zvstng8/revision/5">https://www.bbc.co.uk/bitesize/guides/zvstng8/revision/5</a> <a href="https://www.bbc.co.uk/bitesize/guides/zvstng8/revision/6">https://www.bbc.co.uk/bitesize/guides/zvstng8/revision/6</a> <a href="https://www.bbc.co.uk/bitesize/guides/zvstng8/revision/7">https://www.bbc.co.uk/bitesize/guides/zvstng8/revision/7</a> <a href="https://www.bbc.co.uk/bitesize/guides/zvstng8/revision/8">https://www.bbc.co.uk/bitesize/guides/zvstng8/revision/8</a> <a href="https://www.bbc.co.uk/bitesize/guides/zvstng8/revision/9">https://www.bbc.co.uk/bitesize/guides/zvstng8/revision/9</a> <a href="https://www.bbc.co.uk/bitesize/guides/zh4g4qt/revision/9">https://www.bbc.co.uk/bitesize/guides/zh4g4qt/revision/9</a> <a href="https://make.3dexperience.3ds.com/processes/introduction-to-finishing-processes">https://make.3dexperience.3ds.com/processes/introduction-to-finishing-processes</a> <a href="https://en.wikipedia.org/wiki/Surface_finishing">https://en.wikipedia.org/wiki/Surface_finishing</a>
	Fitness for purpose (influences on design and manufacture, functional requirements, environmental requirements)	<a href="https://www.stem.org.uk/elibrary/resource/33173">https://www.stem.org.uk/elibrary/resource/33173</a> <a href="https://www.bbc.co.uk/bitesize/guides/zj9g4qt/revision/3">https://www.bbc.co.uk/bitesize/guides/zj9g4qt/revision/3</a>
	User requirements (design brief, specification, needs to be met)	<a href="https://en.wikipedia.org/wiki/Design_brief">https://en.wikipedia.org/wiki/Design_brief</a> <a href="https://www.slideshare.net/hairulanuarabdullah7/design-brief-31329584">https://www.slideshare.net/hairulanuarabdullah7/design-brief-31329584</a> <a href="https://technologystudent.com/designpro/problem1.htm">https://technologystudent.com/designpro/problem1.htm</a> <a href="https://www.bbc.co.uk/bitesize/guides/zbn6pbk/revision/3">https://www.bbc.co.uk/bitesize/guides/zbn6pbk/revision/3</a>





	<p>Approaches to design (linear design, iterative design, inclusive design, user centred design, ergonomic design, design for manufacture, design for assembly, sustainable design, 6Rs (reduce, refuse, rethink, repair, reuse, recycle))</p>	<p><a href="https://www.jamesdysonfoundation.com/content/dam/pdf/Standalone_DesignProcess.pdf">https://www.jamesdysonfoundation.com/content/dam/pdf/Standalone_DesignProcess.pdf</a>  <a href="https://www.wraltechwire.com/2008/02/08/linear-vs-iterative-design-does-one-process-have-advantages/">https://www.wraltechwire.com/2008/02/08/linear-vs-iterative-design-does-one-process-have-advantages/</a>  <a href="https://www.data.org.uk/for-education/curriculum/the-iterative-design-process/">https://www.data.org.uk/for-education/curriculum/the-iterative-design-process/</a>  <a href="https://technologystudent.com/despro_fish/iterative1.html">https://technologystudent.com/despro_fish/iterative1.html</a>  <a href="https://www.youtube.com/watch?v=Rnsk5IA52ps">https://www.youtube.com/watch?v=Rnsk5IA52ps</a>  <a href="https://www.youtube.com/watch?v=EZDDUubN5WE">https://www.youtube.com/watch?v=EZDDUubN5WE</a>  <a href="https://www.interaction-design.org/literature/topics/user-centered-design">https://www.interaction-design.org/literature/topics/user-centered-design</a>  <a href="http://www.inclusivedesigntoolkit.com/whatis/whatis.html">http://www.inclusivedesigntoolkit.com/whatis/whatis.html</a>  <a href="https://www.designcouncil.org.uk/resources/guide/principles-inclusive-design">https://www.designcouncil.org.uk/resources/guide/principles-inclusive-design</a>  <a href="https://www.cadcrowd.com/blog/12-awesome-examples-of-ergonomic-product-design/">https://www.cadcrowd.com/blog/12-awesome-examples-of-ergonomic-product-design/</a>  <a href="https://www.trendhunter.com/slideshow/ergonomic-designs">https://www.trendhunter.com/slideshow/ergonomic-designs</a>  <a href="https://www.rolls-royce.com/~media/Files/R/Rolls-Royce/documents/sustainability/value-chain-competitiveness/7-vcc-how-to-design-for-manufacture-and-assembly.pdf">https://www.rolls-royce.com/~media/Files/R/Rolls-Royce/documents/sustainability/value-chain-competitiveness/7-vcc-how-to-design-for-manufacture-and-assembly.pdf</a>  <a href="https://news.ewmfg.com/blog/manufacturing/dfm-design-for-manufacturing">https://news.ewmfg.com/blog/manufacturing/dfm-design-for-manufacturing</a>  <a href="https://www.machinedesign.com/fastening-joining/article/21812784/design-for-assembly">https://www.machinedesign.com/fastening-joining/article/21812784/design-for-assembly</a>  <a href="https://www.dezeen.com/tag/sustainable-design/">https://www.dezeen.com/tag/sustainable-design/</a>  <a href="https://www.ted.com/playlists/28/sustainability_by_design">https://www.ted.com/playlists/28/sustainability_by_design</a>  <a href="https://practicalaction.org/schools/6-rs/">https://practicalaction.org/schools/6-rs/</a>  <a href="https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview">https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview</a></p>
	<p>Research and testing methodologies</p>	<p><a href="https://www.sciencebuddies.org/science-fair-projects/engineering-design-process/testing-redesign">https://www.sciencebuddies.org/science-fair-projects/engineering-design-process/testing-redesign</a>  <a href="http://www.advice-manufacturing.com/Engineering-Analysis-and-Testing.html">http://www.advice-manufacturing.com/Engineering-Analysis-and-Testing.html</a></p>
	<p>Methods of communicating design requirements to technical and non-technical audiences</p>	<p><a href="https://www.lucidchart.com/blog/how-to-explain-technical-ideas-to-a-non-technical-audience">https://www.lucidchart.com/blog/how-to-explain-technical-ideas-to-a-non-technical-audience</a>  <a href="https://www.functionize.com/blog/how-to-deliver-a-technical-presentation-to-a-non-technical-audience/">https://www.functionize.com/blog/how-to-deliver-a-technical-presentation-to-a-non-technical-audience/</a>  <a href="https://www.offerzen.com/blog/tips-communicating-tech-ideas-non-tech-audience">https://www.offerzen.com/blog/tips-communicating-tech-ideas-non-tech-audience</a></p>





1.2 The role of maintenance, repair and installation in engineering.	Types of maintenance activity (planned, reactive, preventative, condition-based monitoring),	<a href="https://www.interplaylearning.com/blog/different-types-of-maintenance">https://www.interplaylearning.com/blog/different-types-of-maintenance</a> <a href="https://msl-ltd.co.uk/reactive-maintenance-vs-planned-maintenance-the-pros-and-cons/">https://msl-ltd.co.uk/reactive-maintenance-vs-planned-maintenance-the-pros-and-cons/</a> <a href="https://inspectioneering.com/tag/condition+based+monitoring">https://inspectioneering.com/tag/condition+based+monitoring</a> <a href="https://en.wikipedia.org/wiki/Condition_monitoring">https://en.wikipedia.org/wiki/Condition_monitoring</a>
	Roles and functions (machine operator, maintenance engineer, maintenance manager)	<a href="https://www.planitplus.net/JobProfiles/View/493/54">https://www.planitplus.net/JobProfiles/View/493/54</a> <a href="https://nationalcareers.service.gov.uk/job-profiles/engineering-operative">https://nationalcareers.service.gov.uk/job-profiles/engineering-operative</a> <a href="https://www.automotiveengineeringhq.com/preventative-maintenance-engineer/">https://www.automotiveengineeringhq.com/preventative-maintenance-engineer/</a> <a href="https://uk.indeed.com/hire/job-description/maintenance-manager">https://uk.indeed.com/hire/job-description/maintenance-manager</a>
	Operations (monitoring, repair, shutdown, servicing)	<a href="https://www.hse.gov.uk/comah/sragtech/techmeasmaintena.htm">https://www.hse.gov.uk/comah/sragtech/techmeasmaintena.htm</a>
	Tools and equipment (mechanical (hand tools, portable power tools), electrical/electronic (hand tools, soldering irons), measurement devices, instrumentation and gauges)	<a href="https://www.toolsturf.com/hand-tools-vs-power-tools/">https://www.toolsturf.com/hand-tools-vs-power-tools/</a> <a href="https://www.fairwayrock.com/blog/what-is-the-difference-between-hand-tools-and-power-tools/">https://www.fairwayrock.com/blog/what-is-the-difference-between-hand-tools-and-power-tools/</a> <a href="https://uk.rs-online.com/web/generalDisplay.html?id=ideas-and-advice/soldering-irons-guide">https://uk.rs-online.com/web/generalDisplay.html?id=ideas-and-advice/soldering-irons-guide</a> <a href="https://housegrail.com/types-of-measuring-tools/">https://housegrail.com/types-of-measuring-tools/</a> <a href="https://gaugehow.com/2019/10/08/30-measuring-instruments-for-mechanical-engineer/">https://gaugehow.com/2019/10/08/30-measuring-instruments-for-mechanical-engineer/</a>
	Installation requirements (provision of services, commissioning)	
	Developments in maintenance (influence of new technologies, environmental influences)	<a href="https://www.prometheusgroup.com/posts/5-transformational-trends-reshaping-industrial-maintenance">https://www.prometheusgroup.com/posts/5-transformational-trends-reshaping-industrial-maintenance</a> <a href="https://www.advancedtech.com/blog/2020-trends-in-industrial-maintenance/">https://www.advancedtech.com/blog/2020-trends-in-industrial-maintenance/</a>





1.3 Approaches to manufacturing, processing and control.	Scale of manufacture (one off, batch, mass, continuous)	<a href="http://www.mrbillington.com/scales-of-production.html">http://www.mrbillington.com/scales-of-production.html</a> <a href="http://www.mr-dt.com/manufacturing/scalesofproduction.htm">http://www.mr-dt.com/manufacturing/scalesofproduction.htm</a>
	Infrastructure (functional, product and matrix arrangements, cellular manufacture, production lines)	<a href="https://en.wikipedia.org/wiki/Matrix_management">https://en.wikipedia.org/wiki/Matrix_management</a> <a href="https://www.epa.gov/sustainability/lean-thinking-and-methods-cellular-manufacturing">https://www.epa.gov/sustainability/lean-thinking-and-methods-cellular-manufacturing</a> <a href="https://www.leansixsigmadefinition.com/glossary/cellular-manufacturing/">https://www.leansixsigmadefinition.com/glossary/cellular-manufacturing/</a> <a href="https://www.britannica.com/technology/assembly-line">https://www.britannica.com/technology/assembly-line</a>
	Level of automation (manual, computer assisted manufacture (CAM), fully automated, robotic)	<a href="https://www.autodesk.com/products/fusion-360/blog/computer-aided-manufacturing-beginners/">https://www.autodesk.com/products/fusion-360/blog/computer-aided-manufacturing-beginners/</a> <a href="https://constructible.trimble.com/construction-industry/what-is-cam-computer-aided-manufacturing">https://constructible.trimble.com/construction-industry/what-is-cam-computer-aided-manufacturing</a> <a href="https://www.bbc.co.uk/bitesize/guides/zjk647h/revision/2">https://www.bbc.co.uk/bitesize/guides/zjk647h/revision/2</a> <a href="https://www.britannica.com/technology/automation/Manufacturing-applications-of-automation-and-robotics">https://www.britannica.com/technology/automation/Manufacturing-applications-of-automation-and-robotics</a>

