TSC Category	Engineering and Manufacturing Fundamentals					
TSC	Metallic Material Characterisation					
TSC Description	Conduct tests and measurement taking to evaluate suitability of metallic materials for uses in manufacturing					
TSC Proficiency Description	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**	**Level 6**
			PRE-ACE-3028-1.1	**PRE-ACE-4028-1.1**	**PRE-ACE-5028-1.1**	
			Identify and evaluate the properties of metals, to select appropriate materials for engineering applications	Characterise and assess the suitability of metals for manufacturing components	Characterise and assess the suitability of superalloys, ceramics and other unconventional materials for manufacturing components	
Knowledge			• Types and properties of metals for manufacturing • Tests for tensile strength, hardness and impact strength • Principles and limitations of hardness tests • Hardening of steels • Heat treatment of steels • Annealing and normalising of steels • Procedures to prepare metallographic samples	• Principles of precision engineering • Types and properties of metals for manufacturing • Methods for measuring mechanical properties of metals • Methods for measuring thermal properties of metals • Methods for measuring optical properties of metals • Methods for measuring chemical properties and microstructure of metals • Methods for relating material property measurements to component requirements • Metal treatment processes	• Principles of precision engineering • Types, properties and applications of ceramics and transparent ceramics • Types, properties and applications of superalloys • Methods for measuring mechanical properties • Methods for measuring thermal properties • Methods for measuring optical properties • Methods for measuring chemical properties, corrosion and microstructure characteristics • Methods to relate material property measurements to component requirements	
Abilities			• Conduct tensile tests, hardness and impacts tests of metals • Apply Fe-Fe3C phase diagrams to facilitate determination of metallic material properties • Report the changes that occur within selected	• Review the required properties of products, parts and/or components to shortlist the range of metals that can meet requirements • Measure mechanical properties of metals for suitability assessment	• Review the required properties of products, parts and/or components to shortlist the range of metals that can meet requirements • Measure mechanical and electrical properties of	

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			metals during the various heat treatment processes • Correlate the effect of heat treatment processes to the mechanical properties of selected metals • Prepare metallographic samples • Review existing processes to meet industrial requirements to assess areas of potential value-add	• Measure thermal properties of metals for suitability assessment • Measure optical properties of metals for suitability assessment • Measure chemical properties and microstructure of metals for suitability assessment • Analyse and determine characteristics of metals for suitability assessment • Assess the suitability of material characteristics for components, in accordance with functional and legislative requirements • Review treatment processes for metals selected, for possibilities to exceed functional requirements	selected materials for suitability assessment • Measure thermal properties of selected materials for suitability assessment • Measure optical properties of selected materials for suitability assessment • Measure chemical properties, corrosion and microstructure characteristics of selected materials for suitability assessment • Perform measurements to analyse and determine characteristics • Assess the suitability of materials in accordance with requirements • Apply systematic approaches to materials characterisation processes, to facilitate knowledge management and optimisation	