Syllabus reference number	Title	Module subcontent	Eddy current testing (ET)		
1	Terminology and history of ET		Level 1	Level 2	Level 3
1.0	History of ET	History of eddy current testing	X	X	X
1.1	Purpose of NDT	What is testing?	X	X	X
		What is the purpose of NDT?	X	X	X
		At what stage of life is NDT performed on a product?	X	X	X
		How does it add value?	X	X	X
		Who may carry out NDT?	X	X	X
		Main NDT methods	X	X	X
1.2	Purpose of ET	Definition: • Electromagnetic interaction between a sensor and a test object conducting electricity	X		
		• Providing information on physical characteristics of the test object	X		
		Applicability and limitations	X		
1.3	Terminology	Please refer to PCN24 standards document	X	X	X

2	Physical principles and associated knowledge		Level 1	Level 2	Level 3
2.0	Fundamentals		X	X	X
2.1	Electricity: elements	Direct current:	X	X	X
		• Current	X	X	X
		• Voltage	X	X	X
		• Resistance	X	X	X
		• Conductance	X	X	X
		• Ohm's Law	X	X	X
		• Resistivity	X	X	X
		• Conductivity	X	X	X
		Units:	X	X	X
		• Conductivity values for some metals	X	X	X
		Alternating current:	X	X	X
		• Sinusoidal current	X	X	X
		• Voltage	X	X	X
		• Amplitude	X	X	X

2.1 *(continued)*		• Frequency	X	X	X
		• Period	X	X	X
		• Phase	X	X	X
		• Vector representation		X	X
		Other periodic currents			X
2.2	Magnetism	Magnetic field	X	X	X
		Lines of force		X	X
		Magnetic field strength	X	X	X
		Permeability	X	X	X
		Flux density (induction)	X	X	X
		Flux	X	X	X
		Hysteresis loop	X	X	X
		Units	X	X	X
		Diamagnetism		X	X
		Paramagnetism		X	X
		Ferromagnetism		X	X
		Reluctance		X	X
		Magnetomotive force		X	X

2.3	Electromagnetism	Magnetic field created by a current (wire, coil)	X	X	X
		Electromagnetic induction phenomenon	X	X	X
		Inductance	X	X	X
		Mutual inductance		X	X
		Electromagnetic coupling	X	X	X
		Induced currents	X	X	X
		Secondary field	X	X	X
		Lenz's Law	X	X	X
		Distribution in conducting materials:	X	X	X
		• Planar wave		X	X
		• Depth of penetration	X		
		• Standard depth of penetration		X	X
		• Amplitude	X	X	X
		• Phase	X	X	X
		Cylindrical conductors:	X	X	X
		• Characteristic frequency	X	X	X
		Real (practical) depth of penetration		X	X

		Impedance:	X	X	X
		● Complex plane representation		X	X
		● Impedance plane diagrams		X	X
2.4	Alternative techniques	Pulsed eddy current			X
		Magnetic field sensors			X
		Alternating current field measurements			X
		Remote field eddy currents			X
2.5	Simulation	Analytical calculation of eddy current tests			X
3	**Product knowledge and capabilities**		**Level 1**	**Level 2**	**Level 3**
3.1	Defectology/product technology	Manufacturing-related discontinuities	X	X	X
		Service-induced discontinuities	X	X	X
		Material properties influencing eddy current testing:	X	X	X
		● Conductivity	X	X	X
		● Permeability	X	X	X
		Product characteristics influencing eddy current testing:		X	X
		● Condition (surface, heat treatment, cold working)		X	X

		• Temperature		X	X
		• Shape		X	X
		• Wall thickness		X	X
		• Accessibility		X	X
		Products being tested:		X	
		• Semi-finished products		X	
		• Pipes		X	
		• Heat exchanger tubes		X	
		• Mechanical parts (for example cars, railway and aircraft industry)		X	
		• Welds (for example offshore)		X	
		• Characteristics of flaws affecting detection		X	
		• Width/depth ratio		X	
3.2	Applications of eddy current testing	Material characterisation: conductivity, ferrite content, metal sorting, heat treatment sorting, thickness of thermochemical treatments (case hardening, nitriding), coating thickness (conductive or non-conductive) and derived information (hardness)	X	X	X
		Detection of discontinuities: cracks (SCC, fatigue), wall thinning, corrosion, deposits, etc	X	X	X

3.3	Capabilities	Depth of penetration	X	X	X
		Conductive materials	X	X	X
		Non-contact	X	X	X
		High speed	X	X	X
		High temperature	X	X	X
		Multiplexed arrays	X		
		Mechanised	X	X	X
3.4	Techniques	Single frequency	X	X	X
		Multi-frequency	X	X	X
		Multi-parameter	X	X	X
		Pulsed current		X	X
		Multiplexed arrays		X	X
		Remote field		X	X
		Similarity rules for surface inspection and tube characteristic/ limit frequencies		X	X
3.5	Codes and standards	Please refer to PCN24 standards document		X	X

4	Equipment		Level 1	Level 2	Level 3
4.1	Eddy current testing system	Instrument	X	X	X
		General-purpose applications – essential functions	X	X	X
		Specific applications:		X	X
		● Pulsed eddy current			X
		● Magnetic field sensors			X
		● Alternating current field measurement			X
4.1 *(continued)*		Mechanised equipment		X	X
		Probes:	X	X	X
		● Combined		X	X
		● Separate transmit – receive		X	X
		● Surface	X	X	X
		● Coaxial	X	X	X
		● Designs		X	X
		● Array probes (description and operating principles)		X	X
		Measurements:	X	X	X
		● Absolute	X	X	X
		● Differential	X	X	X
		● Impedance testing	X	X	X

4.2	Output and signal display	Signal-to-noise ratio	X	X	X
		Distortion/non-linearity	X	X	X
		Filters	X	X	X
4.3	Reference blocks	Material	X	X	X
		Design		X	X
		Production		X	X
		Storage		X	X
4.4	Codes and standards	Please refer to PCN24 standards document		X	X
5	**Information prior to testing**		**Level 1**	**Level 2**	**Level 3**
5.1	Information about the test object	Written instructions	X		
		Identification or designation material:	X	X	X
		• Object to be tested	X	X	X
		• Kind of manufacture	X	X	X
		• Catalogue of defects		X	X
		• Extent of test coverage		X	X
5.2	Test conditions and application of standard	Accessibility		X	X
		Temperature			X
		Humidity			X
		Availability			X
		Unwanted interfering signals			X

		Electric and/or magnetic disturbances			X
		Infrastructure			X
		Particular test conditions		X	X
		Application standard		X	X
		Stage of manufacture or service life when testing is to be carried out			X
		Standards assigned to the test object		X	X
		Requirements of test personnel		X	X
		Acceptance criteria		X	X
5.3	Technique and sequence of performing test	Surface condition		X	
		Surface preparation		X	
		Post-test documentation		X	
		Equipment to be used		X	
		Requirement for recording		X	
5.4	Instructions	Preparation of written procedure			X
		Preparation of written instruction		X	
		Performing inspection in accordance with written instruction	X		

5.4 *(continued)*		Documents			X
		Presentation of the standards, codes and procedures			X
6	**Testing**		**Level 1**	**Level 2**	**Level 3**
6.1	Probe selection as a result of information in **Section 5**	Product:			
		• Grade		X	X
		• Metallurgical condition		X	X
		• Shape		X	X
		• Type of discontinuity sought		X	X
		• Location		X	X
		• Duty of the product		X	X
		• Extent of examination		X	X
6.2	Operating conditions as a result of information in **Section 5**	Temperature		X	X
		Humidity		X	X
		Access		X	X
		Availability		X	X
		Interfering signals		X	X
		Electric and/or magnetic disturbances		X	X
6.3	Parameters	Excitation frequency	X	X	X
		Auxiliary frequencies	X	X	X
		Probe speed	X	X	X

		Probe clearance	X	X	X
		Probe vibration	X	X	X
		Probe centring	X	X	X
6.4	Adjustment curves	Adjustment curves	X	X	X
6.5	Settings	Data acquisition	X	X	X
		Written procedure		X	X
		Written instruction	X	X	
7	**Evaluation and reporting**		**Level 1**	**Level 2**	**Level 3**
7.1	Reporting	Reporting level		X	X
		Examination report	X	X	X
7.2	Evaluation	Characterisation of the indications:		X	X
		• Single-frequency analysis		X	X
		• Multi-frequency analysis		X	X
		• Data analysis		X	X
8	**Assessment**		**Level 1**	**Level 2**	**Level 3**
8.1	Evaluation and confirmation of test reports	Acceptance criteria according to standards, codes and procedures		X	X
		Training of Level 1 and Level 2 of the acceptance criteria			X

9	Quality aspects		Level 1	Level 2	Level 3
9.1	Factors affecting quality of testing	Personnel qualification:	X	X	X
		• ISO 9712	X	X	X
		• Other NDT qualification and certification systems			X
		Format and scope of working procedures			X
		Qualification of NDT procedures			X
		Authorisations (NDT instruction, procedures and personnel)			X
		Developing written instruction		X	
		Working correctly to written instruction	X		
		Traceability of documents		X	X
		Reliability of measurements		X	X

9.2	Knowledge of applicable NDT application and product standards	Correct technique selection		X	
		Use of correct test parameters		X	
		NDT method selection		X	X
		Job-specific training	X	X	X
		Equipment verification	X	X	X
10	**Developments**		**Level 1**	**Level 2**	**Level 3**
10.1	General information	Non-inductive techniques:			X
		• Magneto-optical imaging			X
		• Superconducting quantum interference device (SQUID)			X
		• Giant magnetoresistance			X
		Imaging			X
		Modelling			X