

North Composites Engineering

Specialists in Composite training, processing and repair equipment supply.

North Composites Engineering Ltd is a world class specialist in composite training for Aerospace, Marine, Wind Turbine and the automotive sectors. Our highly qualified engineers use their experiences and knowledge to develop and apply competitive composite design, repair and processing to our in-depth training programs.

Courses can be bespoke or can be accommodated in our scheduled program of training. We endeavour to promote and encourage best practice, knowledge transfer and development in advanced materials and technologies through the provision of quality training, consultancy and products to improve our customer's competitive edge.

Our scheduled training courses are designed to provide knowledge and build essential skills. All our courses combine theory and extensive practical experiences and are delivered in our new dedicated training facility which is fully equipped with the latest ATEX extraction system and is situated conveniently close to the major road and rail networks in the North West of England.

Our specialist knowledge of the composites repair and processing industry has helped us secure the sole distributor for Aeroform France, and Vacmobile.com for the UK and Ireland enabling us to support your processing and repair equipment needs with specialist high quality purpose designed equipment.



North Composites Engineering Composite Courses 2014

Contents

Composite Course Schedule.....	3
Composite Course Schedule 2014	4
Safety Wear	5
Course Descriptions.....	6
Course Title: Introduction to Composites.....	6
Course Title: Wet Layup and Moulding with Pre Pregs	7
Course Title: Composite Repair Basics	8
Course Title: Composite Repair Advanced.....	9
Course Title: Manufacturing, Finishing and Assembling Composites	10
Course Title: Resin Infusion Theory and Practical	11
Course Title: Master and Working Tool Design and Manufacture	12
Course Title: Advanced Pre-Preg Laminating.....	13
Course Title: Producing your own Composite Parts	13
Course Title: Safe Composite Disposal and Recycling	15
Course Title: Business and Management of Composites.....	16

Composite Course Schedule

At North Composites Engineering our highly qualified and experienced engineers apply competitive composite design, repair and processing knowledge to our in-depth training programs. Our experience embraces knowledge transfer of specialist manufacture and repair of composites utilising carbon, glass, Kevlar and hybrid fabrics needed in the design, production, repair and testing of composite structures.

Our experienced professional teaching staff endeavour to promote and encourage best practice, knowledge transfer and development in advanced materials; and have delivered and developed courses within a wide range of different sectors supporting the professional development of engineers, technicians, apprentices and managers.

Our scheduled training in composite and advanced materials, repair, design and manufacture, are designed to provide knowledge and build essential skills. All our courses combine theory and extensive world class practical experiences that enable attendees to develop an understanding of why and how composite materials behave and can be used in many different applications with experienced trainers who are industry professionals with expertise in design, manufacture and repair. Our scheduled courses are delivered in our new dedicated training facility which is fully equipped with the latest ATEX extraction system and is situated conveniently close to the major road and rail networks in the North West of England.

Bespoke Courses

Bespoke courses can be specifically tailored to your own requirements please call to discuss your needs; training can be arranged on a one to one basis or for company based groups. Bespoke courses are individually priced following discussion of requirements and include trainer related expenses.



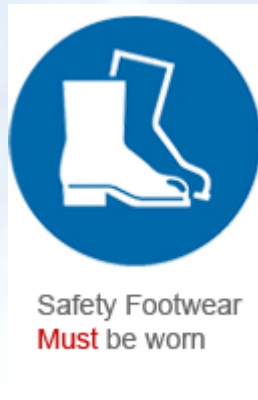
Composite Course Schedule 2014

Course Code	Title	Dates	Prices*
001	Introduction to Composites	03 – 07 March 14 28 April – 02 May 14 22 - 26 Sept 14 24 – 28 March 14	£890.00
002	Wet Layup and Moulding with Pre Pregs	07 – 21 March 14 16 – 20 June 14 28 July - 01 Aug 14 27 - 31 Oct 14	£890.00
005	Composite Repair Basic	12 – 16 May 14 26 Sept – 03 Oct 14 05 – 09 Jan 15	£890.00
006	Composite Repair Advanced	19 – 23 May 14 6 10 Oct 14 12 16 Jan 15	£950.00
007	Manufacturing, Finishing and Assembling Composites	17 - 11 July 14 20 - 24 Oct 14	£950.00
008	Resin Infusion Theory and Practical	03 - 07 March 14 23 - 27 June 14 15 – 19 Sept 14 15 – 19 Dec 14	£890.00
010	Master and Working Tool Design and Manufacture	24 – 28 Nov 14	£1050.00
011	Advanced Pre-Preg laminating	07 - 11 April 14 10 – 14 Nov 14	£890.00
012	Producing your own Composite Parts	30 June - 4 July 14 17 – 21 Nov 14	£890.00
014	Safe Composite Disposal and Recycling	21 – 25 July 14 10 – 15 Nov 14	£330.00
016	Business and Management of Composites	24 Feb 14 29 May 14 3 Nov 14	£165.00

*All quoted prices are subject to VAT at the standard rate at the time of booking

Safety Wear

- ⤴ All course fees are per delegate per course and include provision of materials, tools, protective clothing (excluding footwear) course hand outs and refreshments.
- ⤴ Delegates must wear full length trousers and closed leather shoes or safety footwear as appropriate to the course.
- ⤴ All courses incorporating a practical element require safety footwear.
- ⤴ Where a delegate does not have appropriate footwear or clothing they will not be able to fully engage in the course



Course Descriptions

Course Title: Introduction to Composites

Course Code: 001

Duration: 5 Days

Fees: £890.00 + VAT at standard rate

Course structure: 30% theory, 70% practical

Who is it for: This course is aimed at anyone who requires a sound understanding of the terms, concepts and practices involved in producing composite parts and the health and safety requirements associated with them. The course is suitable for technicians, designers, engineers, managers, sales and administrative staff.

Course content

This course introduces the concepts, properties, structures and uses of advance and composite materials now being used across a number of different industries. This, along with an overview of the methods of manufacture and damage mechanisms for the relevant composite materials is delivered using a mix of theory, demonstrations and practical exercises to consolidate the principles introduced. Safe handling and the risks involved in handling the materials involved in producing composites and damage prevention for completed parts along with the specific health and safety requirements needed are the backbone of this introductory course. The effects of incorrect management and handling of the various materials and combinations is examined along with issues of shelf life, storage and planning.

The course will cover:

- ▲ Health, safety and handling
- ▲ What materials are associated with composites and terminology
- ▲ Examining fibres, fabrics and drape.
- ▲ Resin types, properties storage and disposal and rules of mixture
- ▲ Properties and performance characteristics
- ▲ Cure methods - cure, secondary cure and bonding
- ▲ Tooling and bagging
- ▲ Manufacture methods
- ▲ Component surface finish and treatments effects
- ▲ Material selection parameters, component and tool
- ▲ Material and tool preparation
- ▲ Wet lay-up of a test plate
- ▲ Wet lay-up of a curved part on male/female tool
- ▲ Resin infusion demonstration and practice
- ▲ Manufacture quality issues
- ▲ Joining composite parts
- ▲ Causes, detection and effects of damage

Course Title: Wet Layup and Moulding with Pre Pregs

Course Code: 002

Duration: 5 Days

Fees: £890.00 + VAT at standard rate

Course structure: 25% theory, 75% practical

Who is it for: This course is aimed at anyone who wishes to make original composite parts, convert traditional parts to composites or wants to gain an understanding of wet layup and pre-preg manufacturing techniques. The course is suitable for technicians, designers and engineers.

Course content

This course is design to show the different manufacturing approach for wet layup and pre-preg layup at room and elevated temperatures. Delegates produce simple forms with and without cellular thickening to aid their understanding of the different techniques. The application of such techniques can be applied to structural and non-structural parts across all sector applications. Delegates will have the opportunity to produce a range of composite mouldings including laminates and sandwich structures, using a range of resin, fibre and core materials. These will be utilised to demonstrate inspection techniques and defect recognition.

The course will cover:

- ▲ Health, safety and handling
- ▲ Materials structure, properties and performance characteristics
- ▲ Materials life
- ▲ Reinforcing materials
- ▲ Tooling requirements
- ▲ Draping methods
- ▲ Laminating
- ▲ Gel coat application
- ▲ Wet layup techniques, with and without vacuum bagging
- ▲ Vacuum bagging options
- ▲ Curing methods, temperature and pressure control
- ▲ Carbon and Glass Fibre pre-pregs
- ▲ De-moulding
- ▲ Finishing and trimming
- ▲ Inspection, defect recognition
- ▲ Joining and inserts

Course Title: Composite Repair Basics

Course Code: 005

Duration: 5 Days

Fees: £890.00 + VAT at standard rate

Course structure: 30% Theory, 70% practical

Prior learning (Pre requisite): 001 Introduction to Composites or 002 Wet layup and Moulding with Pre Pregs.

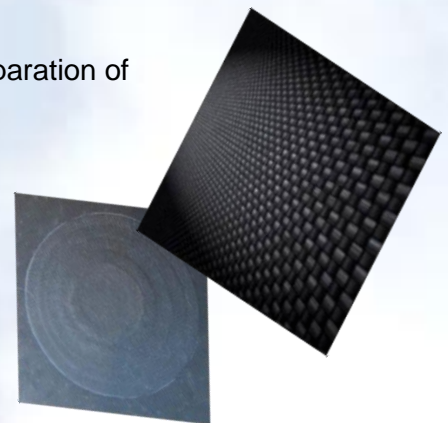
Who is it for: This course is aimed at repair technicians, supervisors, engineers, designers, and managers who need an understanding of the repair process.

Course content

This introduction to composite repairs course focuses on the identification of failure methods and the practical application of implementing repairs using the correct method for the repair. Coverage includes repair preparation consideration of laminate orientation, lay-up and resin selection and application. This is presented along with the use of vacuum bagging, the need for extraction and the tooling requirements for effective repairs. Each delegate will get the opportunity to practice the techniques demonstrated on different repairs. The course will implement an appropriate repair regime linked to the correct usage of repair materials, processes and associated repair.

The course will cover:

- ▲ Health, safety and handling
- ▲ Dust control and equipment use
- ▲ Repair equipment focused upon room cure and elevated heat using hot bonder, Inferred amps and special tooling requirements
- ▲ Preparing a part ready for damage method using various cure methods
- ▲ Damage events and assessment methods
- ▲ Repair processing equipment and materials
- ▲ Cosmetic and gel coat repairs
- ▲ Carrying out repairs to a multi layered laminate
- ▲ Carrying out repairs to laminate with a core structure
- ▲ Repair double sided repair with/without a core
- ▲ Introduction to repair options available and implement preparation of a more complex repair of a curved item
- ▲ Demonstration of NDT methods and simple testing of repairs



Course Title: Composite Repair Advanced

Course Code: 006

Duration: 5 Days

Fees: £950.00 + VAT at standard rate

Course structure: 30% Theory, 70% practical

Prior learning (Pre requisite): 005 Composite Repair Basics

Who is it for: This course is aimed at repair technicians, supervisors, engineers, designers, and managers who need a comprehensive understanding of the repair process. The course builds upon the skills developed in the 005 Composite Repair Basics course.

Course content

This largely practical course follows on from the Composite Repair Basics course, expanding the knowledge of failure methods including repairs to planar and curved surface, damage assessment and the practical application of applying advanced, and structural repairs and extends the concepts of repair testing by the introduction to Non Destructive Testing (NDT). The courses mix of theory and practical application focuses on a range of repair techniques using the readily available repair equipment and explores the need for and the use of specialist repair tools.

The course will cover:

- ▲ Review health, safety and handling
- ▲ Repair equipment calibration and set-up for room and elevated repair processing
- ▲ Cosmetic repair of structural and non-structural components
- ▲ Repair of solid laminates with circular and non-circular damage forms
- ▲ Repair core panels with circular and non-circular damage form
- ▲ Material evaluations and options
- ▲ Scarf and stepped repairs
- ▲ Double sided repairs with different material types
- ▲ Failure methods
- ▲ Damage assessment
- ▲ Panning and application of advanced, extensive and structural repairs
- ▲ Use and application of Non Destructive Testing
- ▲ Introduction to resin infusion repair method

Course Title: Manufacturing, Finishing and Assembling Composites

Course Code: 007

Duration: 5 Days

Fees: £950.00 + VAT at standard rate

Course structure: 30% theory, 70% practical

Who is it for: This course is aimed at technicians, engineers and supervisors who are involved or likely to become involved in the final manufacture, assembly and finishing of composite parts and those involved in the service and maintenance of such parts.

Course content

This course considers the impact of machining, final finishing and the crucial importance of assembly using mechanical fasteners and adhesive bonded joints. Consideration is given to safe practices, preparation and failure due to poor joint design and fastener selection together with the impact these factors have on inspection, maintenance and replacement.

The course will cover:

- ▲ Health, Safety and Handling
- ▲ Coolants and cooling methods
- ▲ Surface coatings and preparation
- ▲ Cutting and trimming
- ▲ Application and correct use of hand and power tools
- ▲ Component and tool, finishing and material options
- ▲ Tool forms: cutting angles, abrasive grades, material and coatings
- ▲ Material property affects resulting from local cutting heat and removal rates
- ▲ Part holding methods during machining and sub-processing options to avoid breakthrough and/or delamination
- ▲ Feeds, speeds and tooling options to achieve surface finish requirements on metallic and non-metallic tools
- ▲ De-burring and trimming options
- ▲ Defects due to machining
- ▲ Polishing and protection
- ▲ Fastener styles and performance: implementation with combinations of material types
- ▲ Installing and changing fasteners to solid and cellular systems
- ▲ Fasteners failure, defects and repair
- ▲ Bonded structural formation and integration

Course Title: Resin Infusion Theory and Practical

Course Code: 008

Duration: 5 Days

Fees: £890.00 + VAT at standard rate

Course structure: 25% theory, 75% practical

Who is it for: Designed to support engineers, designers, researcher, lead technicians and technicians involved in development, tool design or component manufacture using resin infusion techniques.

Course content

This resin infusion course is designed to cover the requirements of the National Occupational Standards for Resin Infusion (SEMTA and COGENT), using the latest resin infusion production techniques. Each delegate will produce composite mouldings, incorporating a variety of features and using a range of techniques and processes to include laminates and sandwich structures using different resin, fibre and core materials.

The course will cover:

- ▲ Health, Safety and Handling
- ▲ Development of vacuum moulding techniques
- ▲ Material selection, storage and life
- ▲ Resins, hardener and accelerant options
- ▲ Tooling configuration
- ▲ Tool preparation
- ▲ Gel coat selection and application
- ▲ Feeder and vacuum systems
- ▲ Resin / fibre calculations
- ▲ Infusion flow: effects of temperature, viscosity and permeability on flow rates, flow rate calculations
- ▲ Bagging and auxiliary equipment selection
- ▲ Open, closed and intensified moulds
- ▲ Curing cycles and faults caused by incorrect cycles
- ▲ Break out
- ▲ Defects causes and solutions
- ▲ Problems associated with Resin Infusion
- ▲ Light RTM advantages disadvantages and process implications
- ▲ Manufacturing defect avoidance in Light RTM

Course Title: Master and Working Tool Design and Manufacture

Course Code: 010

Duration: 5 Days

Fees: £1050.00 + VAT at standard rate

Course structure: 25% theory, 75% practical

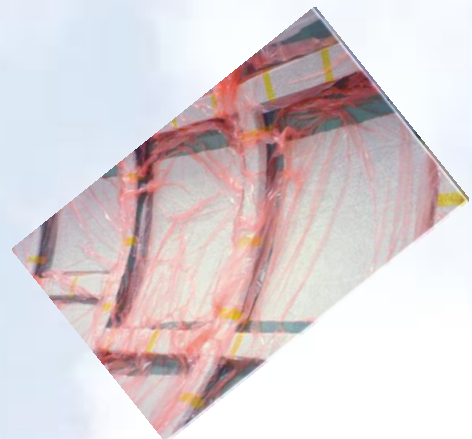
Who is it for: Designed to support engineers, designers, researcher, lead technicians and technicians involved in the development of tooling for composite component manufacture.

Course content

The course develops a wide ranging, understanding of the development and application of current and novel techniques in the production of composite tooling. Delegates will have the opportunity to produce a range of master and working mould tools with complex geometry which incorporate the use of templates and the correct finishing producing a quality self-supporting mould tool. They will have the opportunity to discover the common tool making problems and defects and how to overcome these by design and modification.

The course will cover:

- ▲ Health, safety and handling
- ▲ Composite materials and properties
- ▲ Composite manufacturing – planning
- ▲ Master tool design, material selection and construction
- ▲ Use of traditional, novel, CNC and vac forming to produce master tools
- ▲ Creation of a master tool from an existing component
- ▲ Making a master tool
- ▲ Working tooling design and material selection
- ▲ Making working tools using different materials and cure temperature from a master tool
- ▲ Use of closed tooling, intensifiers and vacuum bagging techniques
- ▲ Curing and tool repair methods
- ▲ Use of tooling to form a two part assembly
- ▲ Introduction to resin infusion tooling
- ▲ Inspection
- ▲ Identifying and rectifying defects
- ▲ Master and working tool storage and management



Course Title: Advanced Pre-Preg Laminating

Course Code: 011

Duration: 5 Days

Fees: £890.00 + VAT at standard rate

Course structure: 30% theory, 70% practical

Prior learning (Pre requisite): 002 Wet layup and Moulding with Pre Pregs

Who is it for: The progression course is aimed at technicians, manufacturers or engineers who need a comprehensive understanding of current and progressive manufacturing processes. They will already have either attended 002 Wet Layup and Moulding with Pre Pregs or have significant prior knowledge and experience of working with pre preg materials.

Course content

This ever changing course is designed to reflect the correct use of modern pre-preg laminating production techniques, incorporating up to date manufacturing and processing methods. Starting from a base of well-established techniques and practices using co-bonding, co-cure and multi part component assembly, this course explores in detail the use of the latest manufacturing technologies and fabric architectures to develop an understanding and competence in the use of state of the art laminating techniques. Combining manufacturing know how including reusable bagging, inflatable consolidators, intensifier forms, bladders, elastic consolidators and form stiffeners, the course is reflective of the advancing changes and industrial practices needed to keep ahead of competition.

Delegates will have the opportunity to produce a range of composite using a variety of material architectures and manufacturing techniques.

The course will cover:

- ▲ Review health, safety and handling
- ▲ Storage and shelf life of materials
- ▲ Techniques and equipment requirements and the drivers for change
- ▲ Use of a working tool in the manufacture of a two part cellular component with varying curing temperatures and multiple curing stages
- ▲ Utilisation of inserts and multi-staged curing on caul and complex components
- ▲ Use of an internal intensifiers in the manufacture of thin walled component
- ▲ Use of vacuum forming techniques and heat sources in component manufacturing
- ▲ Consideration of the impact of current tooling design on the selection of processing and material component options
- ▲ Out of autoclave manufacturing

Course Title: Producing your own Composite Parts

Course Code: 012

Duration: 5 Days

Fees: £890.00 + VAT at standard rate

Course: 35% Theory, 65% Practical

Who is it for: This course is aimed at anyone who wishes to make original composite parts, convert traditional parts to composites and companies who wish to form, move or improve their use of composites. The course is suitable for technicians, designers and engineers, small companies and enthusiasts who would benefit from expert guidance.

Course content

This course reviews composite material properties and the impact these properties have on manufacturing and component performance. From this base delegates will be shown the process of component development from initial concept through to final product inspection, they will have the opportunity to produce parts using different manufacturing techniques and will inspect the final components for defects. The underlying principle of the course is to provide an understanding of the requirements needed to produce a cost effective composite part within a safe and effective business environment.

The course will cover:

- ▲ Health, safety and handling
- ▲ Storage and shelf life of materials
- ▲ Composite materials performance, structure and characteristics
- ▲ Concept to final product development
- ▲ Making replacement parts
- ▲ Making the mould tools
- ▲ Selection of component materials, manufacturing methods and finishing requirements
- ▲ Manufacture of parts using wet lay-up and resin infusion methods
- ▲ Curing options
- ▲ Mould release and finishing
- ▲ Joining methods
- ▲ Troubleshooting, what can go wrong
- ▲ Setting up for manufacture, equipment and material needs, legislation, cost, safety and solutions.
- ▲ Waste disposal and management

Course Title: Safe Composite Disposal and Recycling

Course Code: 014

Duration: 2 Days

Fees: £330.00 + VAT at standard rate

Course structure: 80% Theory, 20% Demonstration

Who is it for: This course is aimed at companies who have a requirement to manage the disposal of composite material waste or composite component end of life disposal in a cost effective, legal and safe manner.

Course content

The course covers all materials being used in the composite sector today and considers effective, legal and safe disposal of both the constituent parts of a composite material, fibre and resin, as well as the disposal of cured waste in a cost effective and safe manner. The course considers waste management, recycling and the safety of operatives involved in manufacturing, processing and disposal and the associated legal requirements.

The course will cover:

- ▲ Drivers, legislation, refurbishment, recycle vs. disposal
- ▲ Impact and relevant legislation
- ▲ Composite material structure, properties and categories
- ▲ Health, safety and handling
- ▲ COSHH
- ▲ Safety legislation
- ▲ Dismantling
- ▲ Dust and ATEX control requirements methods
- ▲ Waste/recycling and environmental legislation
- ▲ Waste disposal
- ▲ Recycling
- ▲ Consequences of failure to comply
- ▲ New developments for end of life disposal
- ▲ Commercial opportunities



Course Title: Business and Management of Composites

Course Code: 016

Duration: 1 Day

Fees: £165.00 + VAT at standard rate

Course structure: 80% Theory, 20% Demonstration

Who is it for: The course is aimed at business leaders, managers and stakeholders looking to move their business/s forward utilising composite and advanced materials.

Course content

A non-technical briefing on the business and management issues associated with design, manufacture and repair of composite materials. The course considers material concepts and potential applications, safe manufacturing processes used for materials and components, the impact of end of life disposal and recycling. The impact the introduction of composite materials has in terms of organisation and new working practices is the underlying theme of the course along with maintaining a safe working environment.

- ▲ Familiarisation of composite materials and processes
- ▲ Composite applications
- ▲ Management of composite materials and processes
- ▲ Organisational and working requirements
- ▲ Health, safety and handling
- ▲ Organisational impact and working practices
- ▲ Composite developments
- ▲ Work force training
- ▲ End of life disposal