

**dark matter composites ltd**

## Composite Course Schedule 2010

We provide the most extensive and comprehensive range of composites courses available. The courses have been developed over a number of years and are continually kept up to date with current theory, practices and materials. Delegates regularly attend our courses from all industry sectors from individuals and small companies through to tier one suppliers and OEMs worldwide.

### 2-Day Courses

This suite of courses is aimed at enthusiasts and small companies who want to use composite materials, and like most, can't find good information or guidance. At the end of each course, participants should feel confident in using readily available materials and equipment to achieve good results, safely in a basic workshop environment. Our course DMSC60 is a compilation of a number of these courses condensed into single one week course. Course fees are £325.00 per delegate, plus VAT at 17.5%.

Course Code	Title	Provisional Course Dates
DMSC01	Pattern Making for Composites	30-31 Jan 2010
DMSC02	Mould Making For Composites	27-28 Mar 2010
DMSC03	Wet Lay-Up Laminating	20-21 Feb 2010 26-27 Jun 2010
DMSC04	Resin Infusion Laminating	10-11 Jul 2010
DMSC05	Pre-Preg Laminating	25-26 Sep 2010
DMSC06	Repairing GRP Composites	24-25 Apr 2010

### 5-Day Courses

This suite of courses is aimed at industry personnel including technicians, engineers, designers and managers. These courses are much more in-depth, wider ranging and follow industry practices throughout. The courses are designed to give personnel the understanding and basic skills to develop and apply in the workplace. These courses are suitable for small companies through to tier one suppliers and OEMs. Course fees are typically £990.00 per delegate, plus VAT at 17.5%.

Course Code	Title	Provisional Course Dates
DMSC50	Introduction to Composite Materials & Processes	8-12 Feb 2010 27 Sep – 1 Oct 2010
DMSC51	Wet Lay-Up Laminating	22-26 Mar 2010
DMSC52	Spray Lay-Up Laminating	Please Contact Us
DMSC53	Resin Infusion Laminating	10-14 May 2010
DMSC54	Basic Pre-Preg Laminating	7-11 Jun 2010 15-19 Nov 2010
DMSC55	Intermediate Pre-Preg Laminating	19-23 Jul 2010
DMSC56	Advanced Pre-Preg Laminating	20-24 Sep 2010
DMSC57 *	Pre-Preg Mould Making	5-9 Jul 2010
DMSC58 *	Trimming of Composites	9-13 Aug 2010
DMSC59 *	Repair of Composites	19-23 Apr 2010 25-29 Oct 2010
DMSC60	Producing Your Own Composite Parts	6-10 Sep 2010
DMSC61	Composite Materials & Processes for Engineers & Designers	22-26 Feb 2010 18-22 Oct 2010
DMSC62	Composites for Renewable Energies	21-25 Jun 2010
DMSC63 *	Composite Tooling Design & Production	22-26 Nov 2010

\* Courses charged at £1,150.00 per delegate, plus VAT at 17.5%, due to materials required.

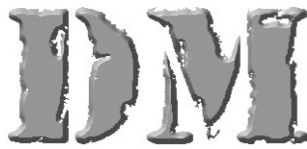
Courses Approved By



t/f +44 (0)1582 791001 [www.darkmattercomposites.co.uk](http://www.darkmattercomposites.co.uk)

Unit 8 Redbourn Industrial Estate, High Street, Redbourn, Hertfordshire, AL3 7LG, UK

Registered in England & Wales No: 5395870



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## *Composite Course Information*

### **Entry Requirements**

No qualifications or previous experience is required unless otherwise stated on the specific course information sheet.

### **Enrolments**

- Enrolments are taken on a first come, first served basis. We require either an on-line booking or a completed enrolment form and full payment.
- On receipt of your booking/enrolment form, we will process your payment if there are places available on the course and issue a full course confirmation.
- If the course is full, your payment will not be processed and you will be advised accordingly.
- Please note that we do not take provisional bookings or hold any places. Course confirmations are only sent if places are available and full payment has been received into our account.

### **Payment**

We accept the following forms of payment and can provide companies with pro-forma invoices where required:

- Credit and Debit cards including Mastercard, Visa, Maestro, Solo and American Express
- Personal or Company cheques payable to 'Dark Matter Composites Ltd'
- Paypal (please note that the payment request will be sent after the booking/enrolment is received)
- BACS, CHAPS or IBAN bank transfers

### **Course Fees**

- The fees are stated on the individual course information sheets and are per delegate per course.
- Course fees stated are in pounds sterling and are subject to UK VAT at the current rate (17.5%).
- EU companies can reclaim VAT through their local VAT system. Non EU delegates cannot reclaim the VAT as the course is a service provided in the UK and not an exported product.
- The fees stated are valid until 31st December 2010.
- All fees stated include: provision of all materials, tools and protective clothing (except footwear, see below); lunch, tea & coffee for each day of the course; and course handouts.
- All course fees must be paid prior to the start of the course.
- Items produced by delegates can be taken away at the end of the course.

### **Locations**

Most of our courses run at our NEW premises in Redbourn, Hertfordshire. Our premises are close a short drive from Hemel Hempstead, St Albans, Harpenden and Luton/Luton Airport. There are good transport links to the M1/M25 and train links in the local towns to central London and other London airports. Occasionally, where courses are run at alternative facilities we will inform delegates prior to processing any enrolment or payment.

### **Times & Attendance**

Each day starts promptly at 9am and finishes at approx. 6pm. Attendance level is expected to be 100%.

### **Clothing, tools and equipment**

- Delegates must wear full-length trousers and closed leather shoes or safety boots (no trainers) during the course.
- Marked tools and equipment shall be issued and checked with delegates at the start of the course. Delegates may be charged for tools and equipment not returned.

### **Course Assessment**

Assessments activities are only built into the 5-day courses, to give feedback on the achievement and potential of delegates. Delegates are assessed on their attendance, quality of practical work completed and a written test. Assessment marks are printed on the course certificates and kept on record.

### **Exclusions**

Travel, accommodation and general sustenance expenses incurred by delegates are excluded from the course prices (except where otherwise stated).

### **Accommodation**

Please note that we have an accommodation list that is available on our website or upon request.

### **Bespoke Training Courses**

Bespoke courses can also be provided to suit specific needs from one to one courses, through to full company training programmes. Tuition can be provided at the customers' own facilities or events. Pricing is dependant on location, number of delegates and course content. Please contact us to discuss your needs.

### **Course Approval**

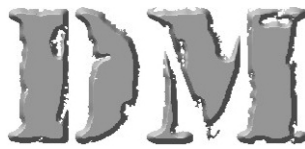
Our courses are approved by the UK composites trade association 'Composites UK' for all sectors of the composites industry. Members of Composites UK are entitled to a 5% discount of our standard courses.



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**dark matter composites ltd**

**Course Title:** Pattern Making for Composites  
**Course Code:** DMSC01  
**Dates:** See current Course Schedule or our Website  
**Duration:** 2 Days, 09:00 – 18:00 hrs  
**Course Fees:** £325.00 per delegate, plus UK VAT at 17.5%

**Summary**

This is an intensive course, suitable for people who would like to know how to produce their own basic patterns for processing composite moulds.

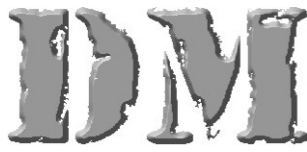
The course follows the full production process for producing two simple patterns using a range of low cost materials and simple techniques: the first pattern produced from an existing part; and the second from interpretation of a sketched design with a split line option.

This will include related theory, demonstrations and practical exercises to demonstrate the methods used to produce patterns suitable for processing composites moulds.

At the end of the course, participants should feel confident in using readily available materials to produce patterns in a basic workshop environment.

**Course content**

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
Day 1	Introduction & equipment issue  <u>Theory</u> Composites & processing methods  Tooling & patterns for composites	<u>Demo &amp; Practical</u> Production of 1 <sup>st</sup> simple pattern from an existing part  Including simplifying, run-offs and surfacing	<u>Demo &amp; Practical</u> Production of 2 <sup>nd</sup> simple pattern Including blocking up, filling, shaping and surfacing	
Day 2	<u>Demo &amp; Practical</u> Final surface finishing of both patterns  Fitting base boards and run-offs to 2 <sup>nd</sup> pattern	<u>Theory, Demo &amp; Practical</u> Sealing & release of both patterns	<u>Demo &amp; Practical</u> Production of pattern split lines and locating lugs  Removal of split boards	<u>Demo &amp; Practical</u> Final pattern checking & rework  Equipment return Reinstate Workshop Summary / Feedback



**dark matter composites ltd**

**Course Title:** Mould Making for Composites  
**Course Code:** DMSC02  
**Dates:** See current Course Schedule or our Website  
**Duration:** 2 Days, 09:00 – 18:00 hrs  
**Course Fees:** £325.00 per delegate, plus UK VAT at 17.5%

**Summary**

This is an intensive course, suitable for people who would like to understand and produce composite moulds for composite processing and don't know where to start.

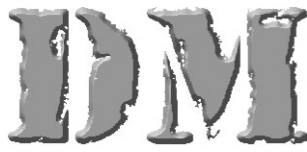
The course follows the full process for producing a high quality glass fibre/epoxy resin mould with a range of additional features, suitable for a range of laminating processes.

This will include related theory, demonstrations and practical exercises to demonstrate the various ways into produce composite moulds suitable for processing composite parts.

At the end of the course, participants should feel confident in using readily available materials, to produce high quality moulds, in a basic workshop environment.

**Course content**

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
Day 1	<u>Introduction &amp; equipment issue</u>  <u>Theory &amp; Demo</u> Composites theory Tooling Considerations Wet lay-up laminating	<u>Demo &amp; Practical</u> Preparation & release of patterns Material preparation Epoxy gel coat application	<u>Demo &amp; Practical</u> Wet lay-up laminate mould Glass fibre & epoxy resin application	<u>Practical</u> Complete lamination of mould Green trim  <u>Practical</u> Breakout & postcure mould
Day 2	<u>Practical</u> Wet lay-up laminate split mould returns Glass fibre & polyester gel coat / resin application	<u>Theory, Demo &amp; Practical</u> Trimming and surface finishing of moulds	<u>Theory &amp; Demo</u> Mould features and modifications  <u>Practical</u> Produce loose tooling Trim & finish tooling features & modifications	<u>Theory, Demo &amp; Practical</u> Surface sealing & releasing of moulds  Equipment return Reinstate Workshop Summary / Feedback



**dark matter composites ltd**

**Course Title:** Wet Lay-Up Laminating  
**Course Code:** DMSC03  
**Dates:** See current Course Schedule or our Website  
**Duration:** 2 Days, 09:00 – 18:00 hrs  
**Course Fees:** £325.00 per delegate, plus UK VAT at 17.5%

**Summary**

This is an intensive course, suitable for people who would like to understand and use wet lay-up composite materials and don't know where to start.

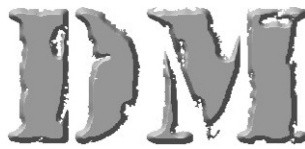
The course follows the full production process for a simple mould and parts, using a range of materials and simple techniques.

This will include related theory, demonstrations and practical exercises to demonstrate the various ways in which composite materials can be applied safely and effectively.

At the end of the course, participants should feel confident in using readily available materials in a basic workshop environment.

**Course content**

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
Day 1	Introduction & equipment issue  <u>Theory</u> Composite materials Wet lay-up laminating	<u>Theory &amp; Demos</u> Pattern & mould release Wet lay-up laminating  <u>Practical</u> Pattern & material preparation Gel coat application	<u>Practical</u> Wet lay-up laminate a simple GRP female mould Glass fibre application	<u>Practical</u> Complete lamination of simple GRP mould  <u>Theory &amp; Demos</u> Trimming and Finishing
Day 2	<u>Demo &amp; Practical</u> Breakout mould Trim & prepare GRP Mould Release GRP Mould	<u>Practical</u> Wet lay-up laminate a simple GRP male part Material preparation Gel coat application Glass fibre application	<u>Demo &amp; Practical</u> Wet lay-up laminate a simple carbon fibre part Material preparation Gel coat application Woven carbon fibre application	<u>Practical</u> Breakout, trim & finish composite parts  Equipment return Reinstate Workshop Summary / Feedback



**dark matter composites ltd**

**Course Title:** Resin Infusion Laminating  
**Course Code:** DMSC04  
**Dates:** See current Course Schedule or our Website  
**Duration:** 2 Days, 09:00 – 18:00 hrs  
**Course Fees:** £325.00 per delegate, plus UK VAT at 17.5%

**Summary**

This is an intensive course, suitable for people who would like to understand resin infused composite materials and don't know where to start.

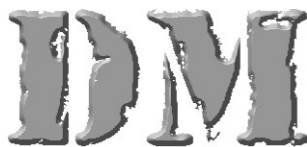
The course follows the full production process for a simple mould and part, using the two most common processes with range of materials and simple techniques.

This will include related theory, demonstrations and practical exercises to demonstrate the various ways in which these composite materials can be applied safely and effectively.

At the end of the course, participants should feel confident in using readily available materials in a basic workshop environment.

**Course content**

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
Day 1	Introduction & equipment issue  <u>Theory</u> Composite materials Infusion processes & vacuum bagging	<u>Demo &amp; Practical</u> Resin flow infusion trial panels with a range of laminates and infusion media Surface vacuum bagging	<u>Demo &amp; Practical</u> Pattern release Gel coat application Prepare & lay-up materials	<u>Practical</u> Design & layout of infusion media Envelope vacuum bagging Resin flow infusion of mould
Day 2	<u>Demo &amp; Practical</u> Breakout & postcure mould  <u>Theory &amp; Demos</u> Trimming and Finishing Mould release	<u>Practical</u> Trim & prepare mould Release mould  <u>Demo</u> Resin film laminating	<u>Practical</u> Resin film laminating of a part Vacuum bagging & oven curing	<u>Practical</u> Breakout, trim & finish composite parts  Equipment return Reinstate Workshop Summary / Feedback



**dark matter composites ltd**

**Course Title:** Pre-Preg Laminating  
**Course Code:** DMSC05  
**Dates:** See current Course Schedule or our Website  
**Duration:** 2 Days, 09:00 – 18:00 hrs  
**Course Fees:** £325.00 per delegate, plus UK VAT at 17.5%

**Summary**

This is an intensive course, suitable for people who would like to understand and use pre-impregnated (pre-preg) composite materials and don't know where to start.

The course follows the very complex production processes for producing pre-preg parts, by breaking it down into simple progressive steps.

This will include related theory, demonstrations and practical exercises to demonstrate the various ways in which composite materials can be applied safely and effectively.

At the end of the course, participants should feel confident in using recommended materials in a basic workshop environment.

**Course content**

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
Day 1	Introduction & equipment issue  <u>Theory</u> Composite materials Pre-preg laminating	<u>Theory, Demo &amp; Practical</u> Tooling care, preparation & release  <u>Demo &amp; Practical</u> Laminate 1 <sup>st</sup> stage of 1 <sup>st</sup> pre-preg part and vacuum debulk	<u>Practical</u> Complete lay-up of 1 <sup>st</sup> pre-preg part  <u>Theory, Demo &amp; Practical</u> Vacuum bagging Oven curing	<u>Theory, Demo &amp; Practical</u> Storing, handling & templating Template 2 <sup>nd</sup> pre-preg part
Day 2	<u>Theory, Demo &amp; Practical</u> Ply orientation, nesting & kitting Prepare materials and tools for 2 <sup>nd</sup> pre-preg part	<u>Practical</u> Laminate 2 <sup>nd</sup> pre-preg part to lay-up specification	<u>Practical</u> Complete lay-up of 2 <sup>nd</sup> pre-preg part to lay-up specification Vacuum bagging Oven curing  <u>Theory &amp; Discussion</u> Causes of & identifying defects	<u>Demo &amp; Practical</u> De-bag & de-mould parts Safe edge parts  Equipment return Reinstate Workshop Summary / Feedback



**dark matter composites ltd**

**Course Title:** Repairing GRP Composites  
**Course Code:** DMSC06  
**Dates:** See current Course Schedule or our Website  
**Duration:** 2 Days, 09:00 – 18:00 hrs  
**Course Fees:** £325.00 per delegate, plus UK VAT at 17.5%

**Summary**

This is an intensive course, suitable for people who would like to understand how to conduct high quality repairs on GRP composite materials and don't know where to start.

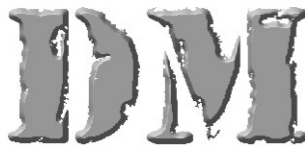
The course follows the processes for a range of cosmetic and structural repairs using a range of materials and simple techniques.

This will include related theory, demonstrations and practical exercises to demonstrate the various ways in which repairs can be applied safely and effectively.

At the end of the course, participants should feel confident in using readily available materials to prepare and complete GRP repairs.

**Course content**

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
Day 1	Introduction & equipment issue  <u>Theory</u> Composite materials Repair of composites	<u>Theory &amp; Demos</u> Trimming and Finishing  <u>Theory &amp; Demos</u> Wet lay-up repairs	<u>Practical</u> Produce a wet lay-up a repair splash Pattern & material preparation Gel coat & glass fibre application	<u>Practical</u> Gel coat & temporary repairs Penetrating dye Material removal Gel coat application
Day 2	<u>Practical</u> Single & double sided repairs Repair sequence Preparation Backing support Glass fibre & gel coat application	<u>Practical</u> Produce pre-cured grafts from the repair splash produced Joining considerations Oven cure	<u>Practical</u> Pre-cured graft repairs Graft and panel preparation Bonding of graft	<u>Practical</u> Cosmetic finishing of repairs  Equipment return Reinstate Workshop Summary / Feedback



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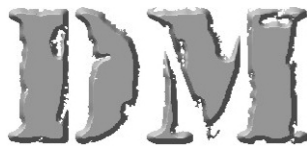
<b>Course Title:</b>	<b>Introduction to Composite Materials &amp; Processes</b>
<b>Course Code:</b>	<b>DMSC50</b>
<b>Dates:</b>	See current Course Schedule or our Website
<b>Duration:</b>	5 Days, 09:00 – 18:00 hrs
<b>Course Fees:</b>	£990.00 per delegate, plus UK VAT at 17.5%

### Summary

This course provides an in-depth and hands on overview of composites. It covers current composite materials and processes, including typical applications, advantages/disadvantages and limitations. The practical activities are based around the manual processes, using these to reinforce the theory covered, as well as highlighting key principles applicable to all processes.

### Course Content

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
M	<u>Introduction</u> Equipment issue <u>Health &amp; Safety</u> <u>Theory</u> Composites history Composites theory	<u>Theory</u> Matrix materials Reinforcing materials Fabric types Lay-up specifications Processing overview	<u>Theory</u> Wet lay-up laminating overview  <u>Demo &amp; Practical</u> Wet lay-up calculations wet lay-up laminating of a mould including material preparation, dispensing, gel coating, wetting out & consolidation using brush application	
T	<u>Practical</u> Completion of wet lay-up mould lamination using roller application	<u>Theory</u> Pre-preg laminating overview  <u>Theory, Demo &amp; Practical</u> Pre-preg templating & material preparation	<u>Demo &amp; Practical</u> Laminate first skin of the pre-preg part Vacuum debulk	<u>Theory &amp; Demo</u> Sandwich panel theory Core materials  <u>Practical</u> Prepare core for pre-preg part
W	<u>Practical</u> Laminate core & closing skin of pre-preg part	<u>Theory &amp; Demo</u> Vacuum bagging materials & methods  <u>Practical</u> Vacuum bagging of pre-preg part	<u>Theory &amp; Practical</u> Matrix curing & post-curing Cure pre-preg part  <u>Theory &amp; Demos</u> Trimming, finishing & inspection of composites	<u>Demo &amp; Practical</u> Breakout & trim wet lay-up mould tool Post-cure mould  <u>Theory &amp; Demo</u> Tooling care & preparation
T	<u>Practical</u> Surface finishing of wet lay-up mould tool  <u>Theory &amp; Demo</u> Mould release & adhesion Release agent types	<u>Practical</u> Release GRP mould for use  <u>Theory &amp; Demos</u> Resin infusion laminating overview	<u>Practical</u> Laminate resin infusion part using a film infusion system Vacuum bagging & oven curing of resin infusion part	<u>Theory, Videos &amp; Discussion</u> Resin transfer moulding Hot press moulding Filament winding Pultrusion Automated tape laying & Fibre placement
F	<u>Practical</u> Breakout, trim & finish resin infusion and pre-preg composite parts		<u>Practical &amp; Discussion</u> Inspection of parts & identifying defects  <u>Written test</u> (30 minutes)	<u>Equipment return</u>  <u>Reinstate Workshop</u>  <u>Summary / Feedback</u>



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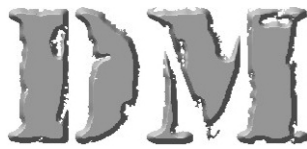
**Course Title:** Wet Lay-Up Laminating  
**Course Code:** DMSC51  
**Dates:** See current Course Schedule or our Website  
**Duration:** 5 Days, 09:00 – 18:00 hrs  
**Course Fees:** £990.00 per delegate, plus vat at 17.5%

**Summary**

Wet lay-up is the most widely used laminating process. Although it is a relatively simple process, it is also a process where good results are difficult to achieve. This course focuses on producing consistent mouldings using a large range of materials, tools and techniques. Most attendees become proficient and semi-skilled within the week.

**Course Content**

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
M	<u>Introduction</u>  <u>Equipment issue</u>  <u>Theory</u> An introduction to composites	<u>Theory</u> Wet lay-up materials, processing & lay-up specifications  <u>Theory, Demo &amp; Practical</u> Tooling care, preparation & release agents	<u>Practical</u> Resin calculations Material preparation Gel coat application  Laminate convex & concave shapes using draping methods with a range of reinforcements & fabrics and polyester resins Brush & small roller application methods	
T	<u>Theory, Demo &amp; Practical</u> Storing, handling & templating	<u>Theory, Demo &amp; Practical</u> Ply orientation, nesting & kitting	<u>Practical</u> Preparation & laminating of internal & external corners, joins & overlaps, acute & radius corners using draping and placement methods with a range of reinforcements & fabrics and epoxy resins	
W	<u>Theory &amp; Demo</u> Continuous laminating over large areas  <u>Theory</u> Sandwich structures & materials	<u>Practical</u> Large area laminating incorporating core materials, loose tooling, nett edges, return edges, vertical surface, joining details, peel plies & green trimming		<u>Theory, Demo &amp; Practical</u> Bonding and joining techniques Fitting inserts and ancillaries
T	<u>Theory</u> Process control & inspection  <u>Demo &amp; Practical</u> De-bag & de-mould parts	<u>Theory &amp; Discussion</u> Causes of & identifying defects	<u>Assessed Practical</u> Laminate assessment part start to finish including tooling preparation, material preparation, templating, split tooling	
F	<u>Assessed Practical</u> Completion of assessed practical		<u>Practical</u> Safe edge parts produced  <u>Written test</u> (30 minutes)	<u>Equipment return</u>  <u>Reinstate Workshop</u>  <u>Summary / Feedback</u>



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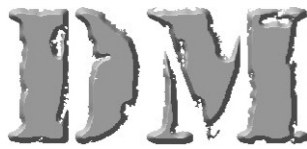
**Course Title:** Spray Lay-Up Laminating  
**Course Code:** DMSC52  
**Dates:** See current Course Schedule or our Website  
**Duration:** 5 Days, 09:00 – 18:00 hrs  
**Course Fees:** £990.00 per delegate, plus UK VAT at 17.5%

**Summary**

Spray lay-up is a common and widely used laminating process that is suited to medium to large mouldings. It is a relatively simple process that is highly dependant on setting up and using the specialised spray equipment in the proper manner to obtain consistent results. This course focuses on setting up the equipment and using a range of techniques on a range of mouldings.

**Course Content**

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
M	<u>Introduction</u>  <u>Equipment issue</u>  <u>Theory</u> An introduction to composites	<u>Theory</u> Wet lay-up & spray lay-up materials and processes Lay-up specifications  <u>Theory, Demo &amp; Practical</u> Tooling care, preparation & release agents	<u>Demo &amp; Practical</u> Set up, use and cleaning of gel coat gun Spray patterns & gun/body articulation Gel coat application to concave & convex shapes, controlling & checking coating thickness	
T	<u>Theory &amp; Demo</u> Storing, handling & preparation of materials  <u>Theory, Demo &amp; Practical</u> Set up, use and cleaning of chopper gun including spray patterns, correlating resin/fibre delivery, roving entry and distribution into the resin stream		<u>Demo &amp; Practical</u> Spray lay-up of concave & convex shapes, application & consolidating Spray patterns, overlaps, gun & body articulation Controlling & checking coating thickness	
W	<u>Theory, Demo &amp; Practical</u> Use and fitting of masks and containment flanges	<u>Demo &amp; Practical</u> Brush application of gel coats	<u>Practical</u> Preparation & spray lay-up of male tool, including external, acute & radius corners, angular surfaces & green trimming	
T	<u>Theory &amp; Demos</u> Trimming & finishing composites  <u>Practical</u> Break out parts & trim edges and surface finish	<u>Theory, Demo &amp; Practical</u> Sandwich structures, materials & preparation  <u>Practical</u> Release of mould surface	<u>Practical</u> Preparation & spray lay-up of detailed female tool, including internal, acute & radius corners, angular surfaces, return & nett edges	
F	<u>Practical</u> Completion of spray lay-up of detailed female tool, including core materials and closing laminate	<u>Demo &amp; Practical</u> De-mould & comparison of parts  <u>Theory &amp; Discussion</u> Causes of & identifying defects	<u>Practical</u> Safe edge parts produced  <u>Written test</u> (30 minutes)	<u>Equipment return</u>  <u>Reinstate Workshop</u>  <u>Summary / Feedback</u>



**dark matter composites ltd**

**Course Title:** Resin Infusion Laminating  
**Course Code:** DMSC53  
**Dates:** See current Course Schedule or our Website  
**Duration:** 5 Days, 09:00 – 18:00 hrs  
**Course Fees:** £990.00 per delegate, plus UK VAT at 17.5%

**Summary**

Resin infusion laminating sits between wet lay-up and pre-preg laminating systems. It offers quality and consistency, with improved health and safety issues over wet lay-up and very low investment than pre-preg. There are a number of infusion processes available which are based on two main types, resin flow infusion and resin film infusion. This course gives an in-depth and hands on approach to understanding how the systems work and how they can be applied to a range of mouldings.

**Course Content**

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
M	<u>Introduction</u>  <u>Equipment issue</u>  <u>Theory</u> Introduction to composite materials	<u>Theory &amp; Demos</u> Resin flow infusion & infusion media  <u>Theory &amp; Demo</u> Sandwich panels & infusion core materials	<u>Theory &amp; Demo</u> Surface vacuum bagging for infusion processes  <u>Practical</u> Resin flow infusion trial panels with a range of laminates, cores and infusion media	
T	<u>Theory &amp; Practical</u> Design layout of infusion distribution media	<u>Practical</u> Lay-up a resin flow infusion into a female tool including core material, media and vacuum bagging		<u>Practical</u> Resin flow infusion of part with core material
W	<u>Theory &amp; Demos</u> Resin film infusion  <u>Practical</u> Production of a mould over a male tool using a 'film infusion system'		<u>Demos &amp; Practical</u> Envelope vacuum bagging  <u>Theory &amp; Practical</u> Oven curing resin film infusion systems	<u>Theory &amp; Demos</u> Trimming, finishing & inspecting composites
T	<u>Demo &amp; Practical</u> Break out parts Trim & prepare mould for use	<u>Theory &amp; Demo</u> Mould release & adhesion  <u>Practical</u> Release mould for use	<u>Practical</u> Resin film laminating of a part, vacuum bagging & oven curing	
F	<u>Practical</u> Breakout, trim & finish resin infused composite parts		<u>Reinstate Workshop</u>  <u>Practical &amp; Discussion</u> Inspect & compare parts produced	<u>Written test</u> (30 minutes)  <u>Equipment return</u>  <u>Summary / Feedback</u>



**dark matter composites ltd**

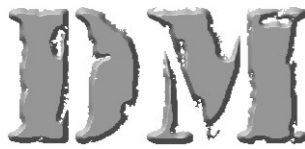
**Course Title:** Basic Pre-Preg Laminating  
**Course Code:** DMSC54  
**Dates:** See current Course Schedule or our Website  
**Duration:** 5 Days, 09:00 – 18:00 hrs  
**Course Fees:** £990.00 per delegate, plus UK VAT at 17.5%

**Summary**

The course follows the very complex production processes for producing pre-preg parts, by breaking it down into simple progressive steps. It includes related theory, demonstrations and practical exercises. These demonstrate the various ways in which a range of pre-preg materials can be applied effectively to a range of technical mouldings.

**Course Content**

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
M	<u>Introduction</u>  <u>Equipment issue</u>  <u>Theory</u> An introduction to composites	<u>Theory</u> Pre-preg materials Pre-preg processing Lay-up specifications  <u>Theory, Demo &amp; Practical</u> Tooling care & preparation Release agents	<u>Practical</u> Prepare tooling Laminate convex shapes using draping methods with a range of reinforcements and fabrics	<u>Theory, Demo &amp; Practical</u> Vacuum bagging Surface bagging Oven cure part
T	<u>Theory, Demo &amp; Practical</u> Storing, handling & templating	<u>Theory, Demo &amp; Practical</u> Ply orientation, nesting & kitting Material application	<u>Demo &amp; Practical</u> Laminating internal & external corners, joins & overlaps, acute & radius corners using draping and placement methods	
W	<u>Theory, Demo &amp; Practical</u> Fully templated envelope bagging of part	<u>Theory, Demo &amp; Practical</u> Pre-preg curing Autoclave cure part  <u>Theory &amp; Practical</u> Inserts in laminates	<u>Practical</u> Preparation & laminating using a female tool incorporating, loose tooling, nett edges, return edges & joggle detail, inserts and debulking	
T	<u>Practical</u> Envelope bagging & autoclave cure part  <u>Theory</u> Process control & inspection	<u>Demo &amp; Practical</u> De-bag & de-mould parts  <u>Theory &amp; Discussion</u> Causes of & identifying defects	<u>Assessed Practical</u> Laminate assessment part start to finish including tooling preparation, material preparation, templating, split tooling, debulking	
F	<u>Assessed Practical</u> Completion of assessed practical Through aperture envelope bagging & autoclave curing of part		<u>Theory &amp; Video</u> Automated tape laying and fibre placement  <u>Practical</u> Safe edge parts produced	<u>Written test</u> (30 minutes)  <u>Equipment return</u>  <u>Reinstate Workshop</u>  <u>Summary / Feedback</u>



**dark matter composites ltd**

**Course Title:** Intermediate Pre-Preg Laminating  
**Course Code:** DMSC55  
**Dates:** See current Course Schedule or our Website  
**Duration:** 5 Days, 09:00 – 18:00 hrs  
**Course Fees:** £990.00 per delegate, plus UK VAT at 17.5%

**Summary**

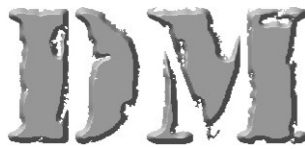
The course focuses on understanding the practical techniques for using a range of core materials to produce sandwich structures with pre-preg composite materials. It includes related theory, demonstrations and practical exercises. These demonstrate the various ways in which a range of core materials can be applied effectively to a range of technical mouldings.

**Course Content**

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
M	<u>Introduction</u> <u>Equipment issue</u> <u>Theory &amp; Demos</u> Introduction to sandwich structures & processing	<u>Practical</u> Laminate first skin, for 2 stage lay-up including peel ply	<u>Theory, Demo &amp; Practical</u> Processing nomex & aluminium honeycomb cores Resin film application Core splicing	<u>Practical</u> Laminate & cure 1 stage core lay-up on curved tool, including de-bulking, core splicing, vacuum bagging & curing
T	<u>Theory, Demo &amp; Practical</u> Processing foam and syntactic core materials Thermoforming foam	<u>Practical</u> Preparation of first skin, laminate resin film, fit honeycomb, foam and syntactic cores, core splicing, internal/external corners and closing skins for 2 stage lay-up		<u>Theory &amp; Demo</u> Inserts, hard points & caul plates  <u>Practical</u> Complete 2 stage lay-up, vacuum bag & cure
W	<u>Practical</u> Laminate & cure outer skin for 3 stage lay-up	<u>Practical</u> Laminate & cure inner skin for 3 stage lay-up	<u>Practical</u> Prepare outer & inner skins, laminate resin film, fit & splice core, fit and pot inserts, vacuum bag and autoclave cure for 3 stage lay-up	
T	<u>Demo &amp; Practical</u> De-bag & de-mould parts	<u>Theory</u> Process control & inspection <u>Theory &amp; Discussion</u> Causes of & identifying defects	<u>Assessed Practical</u> Laminate complete model including preparation, laminating, split tooling, inserts, various core materials, de-bulking	
F	<u>Assessed Practical</u> Complete assessed practical, vacuum bagging, autoclave loading & curing		<u>Practical</u> Safe edge parts produced  <u>Written test</u> (30 minutes)	<u>Equipment return</u> <u>Reinstate Workshop</u> <u>Summary / Feedback</u>

**Entry Requirements**

Attendance of the 'Basic Pre-preg Laminating' course OR recognition of prior learning.



**dark matter composites ltd**

**Course Title:** Advanced Pre-Preg Laminating  
**Course Code:** DMSC56  
**Dates:** See current Course Schedule or our Website  
**Duration:** 5 Days, 09:00 – 18:00 hrs  
**Course Fees:** £990.00 per delegate, plus UK VAT at 17.5%

**Summary**

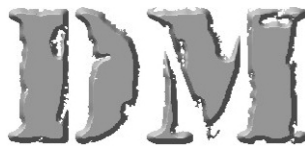
The course is aimed at supervisors and head technicians. The course focuses on understanding the theory and practical techniques associated with key manufacturing processes. Emphasis is on effective application of production controls and fault diagnosis in the production environment.

**Course Content**

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
M	<u>Introduction</u> <u>Equipment issue</u> <u>Theory &amp; Discussion</u> Various forms of pre-preg processes	<u>Theory &amp; Discussion</u> Interpreting material datasheets & material preparation	<u>Theory &amp; Discussion</u> Production controls & fault diagnosis	<u>Theory &amp; Demos</u> Production tooling, sealing & releasing
T	<u>Practical</u> Selection & application of surface sealers & release agents	<u>Theory &amp; Discussion</u> Laminating to meet engineering requirements	<u>Practical</u> Production of lay-up manual to meet engineering requirements	
W	<u>Practical</u> Lay-up of parts requiring complex & re-usable vacuum bagging	<u>Theory &amp; Discussion</u> Vacuum bagging materials / processes  <u>Demo &amp; Practical</u> Complex vacuum bagging techniques	<u>Demo &amp; Practical</u> Production of re-usable vacuum bag	<u>Practical</u> Sealing frame for re-usable vacuum bags
T	<u>Theory &amp; Discussion</u> Curing pre-preg materials	<u>Theory &amp; Demo</u> Use of ovens & autoclaves	<u>Practical &amp; Discussion</u> Oven & autoclave programming running, monitoring & diagnostics	
F	<u>Demos &amp; Practical</u> Inspecting & testing composites	<u>Theory &amp; Discussion</u> Interpreting & rectifying faults	<u>Final Discussion</u>  <u>Written test</u> (60 minutes)	<u>Equipment return</u>  <u>Reinstate Workshop</u>  <u>Summary / Feedback</u>

**Entry Requirements**

Attendance of the 'Intermediate Pre-preg Laminating' course OR recognition of prior learning.



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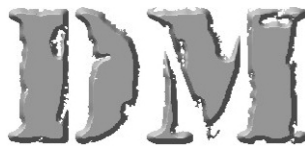
**Course Title:** Pre-Preg Mould Making  
**Course Code:** DMSC57  
**Dates:** See current Course Schedule or our Website  
**Duration:** 5 Days, 09:00 – 18:00 hrs  
**Course Fees:** £1,150.00 per delegate, plus UK VAT at 17.5%

**Summary**

The course provides training for understanding and using pre-impregnated composite materials to produce composite tooling. It includes related theory, demonstrations and practical exercises. These demonstrate the various ways in which glass/carbon reinforcements and low temperature resins can be applied effectively to produce moulds and jigs for use in production.

**Course Content**

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
M	<u>Introduction</u> <u>Equipment issue</u>  <u>Theory</u> Introduction to composites	<u>Theory</u> Production tooling for composites	<u>Theory &amp; Demos</u> Templated, balanced, orientated plies & ply joins for tooling  <u>Practical</u> Template plies for single part tool	<u>Theory, Demo &amp; Practical</u> Pattern preparation & releasing
T	<u>Theory, Demo &amp; Practical</u> Handling, preparation & application of low temperature pre-preg	<u>Practical</u> Lay-up first ply of a single part tool using templated plies	<u>Theory, Demo &amp; Practical</u> Vacuum bagging for debulks and curing	<u>Practical</u> Complete lay-up of single part tool, bagging & autoclave curing
W	<u>Demo &amp; Practical</u> Break out single part mould  <u>Theory &amp; Practical</u> Post-curing of tooling	<u>Theory</u> Pattern checking, splitting & locators  <u>Demo &amp; Practical</u> Joint boarding, fitting locators & release of pattern	<u>Practical</u> Lay-up of a multi part tool using material squares and including shaped locators, bushes, dowels, bagging & autoclave curing	
T	<u>Demo &amp; Practical</u> Prepare for second stage of multi part tool	<u>Practical</u> Lay-up second stage of a multi part tool using material squares and including shaped locators, bushes, dowels, bagging & autoclave curing		
F	<u>Practical</u> Break out multi part mould & post-cure Trimming, finishing & cleaning of tooling produced		<u>Practical</u> Sealing of tooling produced  <u>Written test</u> (30 minutes)	<u>Equipment return</u> <u>Reinstate Workshop</u> <u>Summary / Feedback</u>



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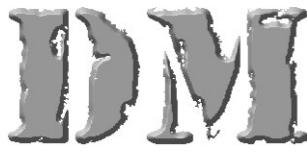
**Course Title:**            **Trimming of Composite Materials**  
**Course Code:**            **DMSC58**  
**Dates:**                    See current Course Schedule or our Website  
**Duration:**                5 Days, 09:00 – 18:00 hrs  
**Course Fees:**            £1,150.00 per delegate, plus UK VAT at 17.5%

**Summary**

The course provides training for understanding and using a range of hand, power and bench mounted tools for trimming a range of composite parts. It includes lectures, demonstrations and practical exercises. These demonstrate a range of trimming and finishing techniques applied to a range of reinforcement and matrix materials. Emphasis is on the effectiveness and application of different techniques.

**Course Content**

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
M	<u>Introduction</u>  <u>Equipment issue</u>  <u>Theory</u> Introduction to composites	<u>Theory &amp; Demos</u> Identifying materials & handling parts  Safety briefing for using air and electrical tools	<u>Theory</u> Types, uses & control of engineering sketches & drawings  <u>Practical</u> Interpreting & extracting information from engineering sketches & drawings	
T	<u>Theory &amp; Demos</u> Measuring & marking out composite parts  <u>Practical</u> Measure & mark a range of features on a range of composite parts/materials using surface tables, height gauges, scribes, rules & jigs		<u>Theory &amp; Demos</u> Cutting composite materials  <u>Practical</u> Rough cut a range of profiles in a range of composite parts/materials using a range of hand, bench and power tools	
W	<u>Theory &amp; Demos</u> Drilling & boring composite materials  <u>Practical</u> Drill & bore a range of hole features in a range of composite materials using hand, air and bench mounted tools		<u>Theory &amp; Demos</u> Filing & sanding composite materials  <u>Practical</u> Final shaping of a range of features in a range of composite materials using hand, air and bench mounted tools	
T	<u>Theory, Demos &amp; Practical</u> Cleaning & polishing composite materials using compounds, abrasives & hand tools	<u>Theory, Demos &amp; Practical</u> Producing composite assemblies  Adhesive bonding  Fixtures & fittings	<u>Theory &amp; Practical</u> Planning operation sequences  <u>Theory &amp; Discussion</u> Interpreting & rectifying faults	<u>Assessed Practical</u> Planning & trimming a range of test piece components
F	<u>Assessed Practical</u> Trim & finish a range of test components and complete final assembly of part		<u>Reinstate Workshop</u>  <u>Equipment return</u>	<u>Written test</u> (30 minutes)  <u>Summary / Feedback</u>



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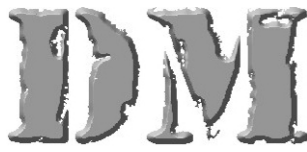
**Course Title:** Repair of Composites  
**Course Code:** DMSC59  
**Dates:** See current Course Schedule or our Website  
**Duration:** 5 Days, 09:00 – 18:00 hrs  
**Course Fees:** £1,150.00 per delegate, plus UK VAT at 17.5%

**Summary**

This course provides comprehensive training for understanding and applying a range of repair techniques to composite mouldings. Coverage includes cosmetic through to structural repairs on mouldings matched to the various composite processes. It includes lectures, demonstrations and practical exercises. Emphasis is on recognising materials and processes used for mouldings and applying effective repairs methods.

**Course Content**

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
M	<u>Introduction</u>  Equipment issue  <u>Theory</u> Introduction to composite materials & processes	<u>Theory &amp; Discussion</u> Damage detection Repair of composites  <u>Theory &amp; Demos</u> Trimming and Finishing	<u>Demo &amp; Practical</u> Preparation of cosmetic & temporary repairs	<u>Theory, Demo &amp; Practical</u> Wet lay-up laminating Cosmetic gel coat repairs Temporary repairs
T	<u>Theory &amp; Discussion</u> Failures modes & predicting failure  <u>Demo &amp; Practical</u> Preparation of single sided minor structural repairs	<u>Demo &amp; Practical</u> Wet lay up single sided repairs  Partial thickness and through laminate Temporary backing structures	<u>Demo &amp; Practical</u> Removal of temporary repair  Preparation of tapered/scarf surfaces Single & double sided minor and major structural repairs	<u>Theory &amp; Demo</u> Vacuum bagging  <u>Demo &amp; Practical</u> Vacuum bagged repairs Resin infusion materials & repairs
W	<u>Theory &amp; Demo</u> Mould release  <u>Practical</u> Production of a repair splash / temporary mould	<u>Theory, Demo &amp; Practical</u> Preparation of type A, B & C major structural sandwich panel repairs in thermo-plastic and thermo-set panels	<u>Theory, Demo &amp; Practical</u> Pre-preg materials & repairs  Material matching & preparation Core preparation & splicing	<u>Demo &amp; Practical</u> Laminate pre-preg repairs  <u>Theory &amp; Practical</u> Curing pre-preg repairs
T	<u>Theory, Demo &amp; Practical</u> Graft joining considerations Adhesive bonding Produce pre-cured repair grafts	<u>Practical</u> Pre-cured graft repairs Graft and panel preparation Bonding of graft	<u>Discussion &amp; Practical</u> Inspection, evaluation and review of repairs completed  <u>Discussion</u> Assessment Task Briefing	<u>Assessed Practical</u> Assessment of damage, repair strategy Preparation of repairs
F	<u>Assessed Practical</u> Assessment of damage, repair strategy, preparation & completion of a range of test piece components including step sanded surface preparation			<u>Reinstate Workshop</u>  <u>Written test</u> (30 minutes)  <u>Equipment return</u>  <u>Summary / Feedback</u>



## dark matter composites ltd

<b>Course Title:</b>	<b>Producing Your Own Composite Parts</b>
<b>Course Code:</b>	<b>DMSC60</b>
<b>Dates:</b>	See current Course Schedule or our Website
<b>Duration:</b>	5 Days, 09:00 – 18:00 hrs
<b>Course Fees:</b>	£990.00 per delegate, plus UK VAT at 17.5%

### Summary

This course is aimed at those who want to make their own patterns and composite moulds and components. The course focuses on producing good quality parts using cost effective methods and materials. At the end of the course, participants should feel confident in using readily available materials to produce simple patterns, moulds and parts in a basic workshop environment.

### Course Content

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
M	<u>Introduction</u>  <u>Equipment issue</u>  <u>Theory</u> Introduction to composite materials & processes	<u>Theory &amp; Demos</u> Tooling types and materials Pattern & mould making	<u>Practical</u> Production of a simple pattern using tooling board, including blocking up, shaping, filling & surfacing using a range of bench tools and hand tools	
T	<u>Theory, Demo &amp; Practical</u> Pattern preparation & release agents  Surface seal & release patterns	<u>Theory &amp; Demos</u> Wet lay-up laminating Wet lay-up calculations	<u>Practical</u> Wet lay-up laminating of a mould including material preparation, dispensing, gel coating, wetting out & consolidation of glass fibre chopped strand matt, brush & roller application methods	
W	<u>Demo &amp; Practical</u> Break out wet lay-up moulds  <u>Theory, Demo &amp; Practical</u> Trimming & finishing composites Trim & post-cure wet lay-up moulds	<u>Theory</u> Resin infusion laminating  <u>Demo &amp; Practical</u> Trial panels & evaluation	<u>Practical</u> Laminating a part for resin flow infused part including layout design of distribution media and fitting of distribution media	<u>Theory, Demo &amp; Practical</u> Vacuum bagging Surface bagging of infusion parts  <u>Practical</u> Resin infusion of parts
T	<u>Practical</u> Surface finish & release wet lay-up moulds for use  <u>Theory</u> Pre-preg laminating	<u>Theory, Demo &amp; Practical</u> Pre-preg storing, templating, ply orientation, nesting & kitting	<u>Demo &amp; Practical</u> Pre-preg laminating of carbon fibre part	<u>Theory, Demo &amp; Practical</u> Sandwich structures Core materials Core preparation
F	<u>Practical</u> Laminate core & closing skins of pre-preg part  <u>Demo &amp; Practical</u> Envelope vacuum bagging of pre-preg part	<u>Theory &amp; Practical</u> Matrix curing & post-curing Cure pre-preg part  <u>Practical</u> Trim & finish composite parts produced	<u>Practical &amp; Discussion</u> Inspection of parts & identifying defects  <u>Reinstate Workshop</u>	<u>Written test</u> (30 minutes)  <u>Equipment return</u>  <u>Summary / Feedback</u>



## dark matter composites ltd

<b>Course Title:</b>	<b>Composite Materials &amp; Processes for Engineers &amp; Designers</b>
<b>Course Code:</b>	<b>DMSC61</b>
<b>Dates:</b>	See current Course Schedule or our Website
<b>Duration:</b>	5 Days, 09:00 – 18:00 hrs
<b>Course Fees:</b>	£990.00 per delegate, plus UK VAT at 17.5%

### Summary

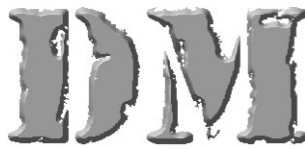
This is our most intensive and in-depth course covering current composite materials and processes. The course provides an honest and open insight into working with composite materials, with sessions that are informative, interactive and thought provoking. The key focus is on component design principles and production considerations and controls.

### Entry Requirements

This is a difficult course and delegates will need to have a sound technical background in design, engineering or materials, or have relevant experience.

### Course Content

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
M	<u>Introduction</u> <u>Equipment issue</u> <u>Health &amp; Safety</u> Measures & Legislation <u>Theory &amp; Discussion</u> Composites history Composites theory	<u>Theory &amp; Discussion</u> Matrix materials Reinforcing materials Fabric types Laminate theory and ply orientation Lay-up specifications	<u>Theory &amp; Discussion</u> Sandwich structures Core materials Processing composite materials  <u>Theory &amp; Practical</u> Tooling care and preparation Release agents	<u>Theory &amp; Guided Practical</u> Wet lay up laminating including calculations, gel coat application & glass chopped strand matt application
T	<u>Theory</u> Resin infusion laminating  <u>Demo &amp; Practical</u> Trial panels & evaluation	<u>Theory &amp; Discussion</u> Vacuum bagging  <u>Guided Practical</u> Design of distribution media for resin flow infused part	<u>Guided Practical</u> Gel coating, laminating, & surface vacuum bagging of resin flow infusion part	<u>Practical &amp; Discussion</u> Resin infusion and evaluation of parts  <u>Demonstration</u> Resin film infusion laminating
W	<u>Theory</u> Pre-preg laminating  <u>Theory &amp; Guided Practical</u> Material templating, ply orientation, nesting & kitting	<u>Theory &amp; Guided Practical</u> Pre-preg laminating of part with sandwich structure	<u>Demo &amp; Practical</u> Envelope vacuum bag & cure pre-preg part  <u>Theory</u> Matrix curing & post-curing	<u>Theory &amp; Videos</u> Resin transfer moulding Hot press moulding Filament winding Pultrusion Automated tape laying & fibre placement
T	<u>Theory &amp; Discussion</u> Causes of and identifying defects Manual & NDT inspection Production & quality controls In-service monitoring	<u>Theory, Demos &amp; Practical</u> Breakout parts produced Trimming & finishing composites	<u>Theory &amp; discussion</u> Adhesion & bonding methods  <u>Theory &amp; Demos</u> Failure modes Re-work & repair principles Repair techniques	<u>Guided Practical</u> GRP and pre-preg repairs including removal of damage, preparation and laminating of repairs
F	<u>Theory &amp; Discussion</u> Tooling types & materials Tooling and component design principles Re-cycling & environmental issues	<u>Practical &amp; Discussion</u> Case studies for tooling and component design	<u>Theory &amp; Discussion</u> Laminate calculations Finite element analysis Testing composites On-line resources  <u>Reinstate Workshop</u>	<u>Written test</u> (60 minutes)  <u>Equipment return</u>  <u>Summary / Feedback</u>



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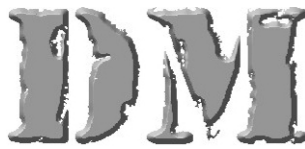
<b>Course Title:</b>	<b>Composites for Renewable Energies</b>
<b>Course Code:</b>	<b>DMSC62</b>
<b>Dates:</b>	See current Course Schedule or our Website
<b>Duration:</b>	5 Days, 09:00 – 18:00 hrs
<b>Course Fees:</b>	£990.00 per delegate, plus UK VAT at 17.5%

### Summary

This course enables the candidate to develop the knowledge and understanding to assist with design, construction and working with turbine blades produced in composite materials. Hands on practical experience is covered alongside theory & demonstrations aimed at wind, tidal and wave turbine systems.

### Course Content

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
M	<u>Introduction</u>  <u>Equipment issue</u>  <u>Health &amp; Safety</u> Measures & Legislation  <u>Theory &amp; Discussion</u> Composites theory	<u>Theory &amp; Discussion</u> Matrix materials Reinforcing materials Fabric types Laminate theory and ply orientation Sandwich structures Core materials	<u>Theory &amp; Discussion</u> Summary of composite processing methods  <u>Theory &amp; Discussion</u> Typical blade sections, associated construction & processing methods	<u>Theory &amp; Discussion</u> Engineering principles applicable to blade design  Aerodynamic principles of blade design Principles of laminate design to blades Re-cycling & environmental issues
T	<u>Theory</u> Resin infusion laminating Vacuum bagging  <u>Demo &amp; Practical</u> Trial panels & evaluation	<u>Theory, Demo &amp; Practical</u> Tooling care and preparation Release agents  <u>Practical</u> Design of distribution media for resin flow infused blade section	<u>Practical</u> Gel coating, laminating, & surface vacuum bagging of resin flow infused blade section	<u>Practical &amp; Discussion</u> Resin infusion and evaluation of blade sections  <u>Demonstration</u> Resin film infusion laminating of a blade section
W	<u>Theory</u> Pre-preg laminating Automated tape laying and fibre placement	<u>Theory, Demo &amp; Practical</u> Storing, handling & templating	<u>Theory, Demo &amp; Practical</u> Ply orientation, nesting & kitting Material application Prepreg laminating of blade section and spar	
T	<u>Practical</u> Fully templated vacuum bagging of part	<u>Theory</u> Matrix curing & post-curing Trimming & finishing composites Adhesion & bonding	<u>Demo &amp; Practical</u> Breakout parts produced Trimming, finishing and bonded assembly of blade sections	
F	<u>Theory &amp; Demos</u> Failure modes Re-work & repair principles Repair techniques	<u>Practical</u> GRP and pre-preg repairs including removal of damage, preparation and laminating of repairs	<u>Theory &amp; Discussion</u> Causes of and identifying defects Manual & NDT inspection Production & quality controls In-service monitoring	<u>Reinstate Workshop</u>  <u>Written test</u>  <u>Equipment return</u>  <u>Summary / Feedback</u>



**dark matter composites ltd**

**Course Title:** Composite Tooling Design & Production  
**Course Code:** DMSC63  
**Dates:** See current Course Schedule or our Website  
**Duration:** 5 Days, 09:00 – 18:00 hrs  
**Course Fees:** £1,150.00 per delegate, plus UK VAT at 17.5%

**Summary**

This course enables the candidate to develop the knowledge and understanding to apply good composites design principles to the design and production of composite tooling and the related component. It includes related theory, demonstrations and practical exercises to demonstrate the various ways in which glass/carbon reinforcements and low temperature resins can be applied effectively to produce moulds and jigs for use in production.

**Course Content**

	09:00 – 11:00	11:15 – 13:15	13:45 – 15:45	16:00 – 18:00
M	<u>Introduction</u>  <u>Equipment issue</u>  <u>Health &amp; Safety</u> Measures & Legislation  <u>Theory &amp; Discussion</u> Composites theory	<u>Theory &amp; Discussion</u> Matrix materials Reinforcing materials Fabric types Laminate theory and ply orientation Sandwich structures Core materials	<u>Theory &amp; Discussion</u> Summary of composite processing methods  <u>Theory &amp; Discussion</u> Metal verses composite tooling, advantages and disadvantages Thermal expansion of materials	<u>Theory &amp; Discussion</u> <i>Tooling types &amp; materials</i>  <i>Tooling &amp; component design principles</i> Co-curing and co-bonding principles
T	<u>Theory, Demo &amp; Practical</u> Tooling care and preparation Pattern surface preparation Surface sealers Release agents	<u>Theory, Demo &amp; Practical</u> Pattern run-off boards, split lines & locating lugs	<u>Theory, Demo &amp; Practical</u> Wet lay-up laminating Material preparation & calculations Gel coat application	<u>Demo &amp; Practical</u> Wet lay-up laminate first mould tool section
W	<u>Practical</u> Remove split board and prepare pattern  <u>Theory</u> Resin infusion laminating	<u>Demo &amp; Practical</u> Resin film infusion laminating of second mould tool section	<u>Theory, Demo &amp; Practical</u> Vacuum bagging Matrix curing & post-curing Breakout & postcure mould tools sections produced	<u>Theory &amp; Demo</u> Prepreg laminating for tooling Templated, balanced & orientated plies Laminating with material squares
T	<u>Theory, Demo &amp; Practical</u> Storage, handling & preparation of low temperature pre-preg	<u>Demo &amp; Practical</u> Lay-up a prepreg mould tool using material squares, vacuum debulking, dowelling & laminating drill/fixing bushes		<u>Practical</u> Complete lay-up of prepreg mould tool, vacuum bagging & autoclave curing
F	<u>Theory, Demo &amp; Practical</u> Trimming, finishing, cleaning & inspecting of tooling	<u>Theory, Demo &amp; Practical</u> Tooling modifications & loose tooling Backing structures	<u>Practical &amp; Discussion</u> Case studies for tooling and component design	<u>Reinstate Workshop</u>  <u>Written test</u>  <u>Equipment return</u>  <u>Summary / Feedback</u>



dark matter composites ltd

## Course Enrolment Form

Please complete the form in BLOCK letters

Course Code	Course Title	Course Date	Course Fee
Where did you find out about the course?			

### Personal Details

Title	First Name	Surname	Date of Birth
Address			
Postcode			
Telephone No.	Mobile No.	Email	
Do you have any special dietary requirements or special needs? If 'Yes' please give details:			Yes / No

### Emergency Contact Details

Name	Relationship	Telephone No.
Address		
Postcode		

### Payment

- Personal/Company cheque enclosed, payable to 'Dark Matter Composites Ltd'
- UK Bank Transfer (Dark Matter Composites, Sort code 08-92-50, Account No. 70152234)
- International Bank Transfer (payment details shall be provided upon enrolment receipt)
- Paypal (we will send out a payment request on receipt of this application)
- Credit Card

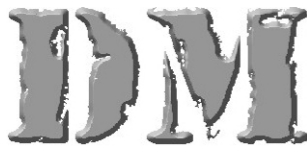
Card Type	MasterCard / Visa / Maestro (Switch) / Visa Electron / Solo / American Express													
Card Number														
Start Date						Expiry Date								
Security Number						Issue Number (switch only)								
Name on Card														
Address of Card Holder														

I confirm that I agree to the 'Course Enrolment Conditions' and that the information given above is correct. For applicants under 18 years old at the start of the course, I also confirm that I am a parent/legal guardian/employer (please delete as appropriate) of the applicant and give my consent for them to attend the course.

Name ..... Signature ..... Date .....

Please send completed forms to the address below. On receipt, we will process your enrolment and payment. Full course confirmations shall only be sent once payment has cleared.

t/f +44 (0)1582 791001 www.darkmattercomposites.co.uk  
Unit 8 Redbourn Industrial Estate, High Street, Redbourn, Hertfordshire, AL3 7LG, UK  
Registered in England & Wales No: 5395870



## **dark matter composites ltd**

### **Course Enrolment Conditions**

1. It is the customers' responsibility to check that the course is suitable for its delegate(s) training needs. We shall advise on course content and anticipated outcome as requested.
2. Enrolments are taken on a first come, first served basis and shall only be confirmed on receipt of completed enrolment forms and receipt of full payment.
3. Courses will be confirmed as running as soon as sufficient applications are received and no later than 2 weeks prior to the course start date.
4. All course fees are per delegate per course and include: provision of all materials, tools and protective clothing (except footwear, see below); lunch for each day of the course; and course handouts.
5. Payment of course fees are due prior to the course start date. Prices stated are in pounds sterling and subject to VAT at the current rate.
6. Travel, accommodation and general sustenance expenses incurred by delegates are excluded from the course fees (except where otherwise stated).
7. Cancellations by delegates prior to the course will be refunded on the following basis: 14 days or more 80%; less than 14 days no refund. If a cancellation is unavoidable by DMC, an alternative date or full refund will be given.
8. Transferral of bookings applies to a change in delegate only and not a change in course. Transferrals within the 14 days prior to the course, will be subject to an administration charge equivalent to 10% of the course fee.
9. Delegates must advise DMC of any dietary requirements or special needs on enrolment.
10. Delegates attending DMC courses must comply with safety procedures covered at the start of each course. DMC seeks to achieve the highest standards in health, safety and the environment and anticipate that customers and their delegates will assist us in achieving these objectives.
11. Delegates must wear full-length trousers and closed leather shoes or safety boots (no trainers) during the course. Delegates who do not wear appropriate clothing and footwear will not be able to take a full part in practical sessions.
12. For company and group bookings, an enrolment form must be completed for each delegate.
13. Marked tools and equipment shall be issued and checked with delegates at the start of the course. Delegates may be charged for tools and equipment not returned.