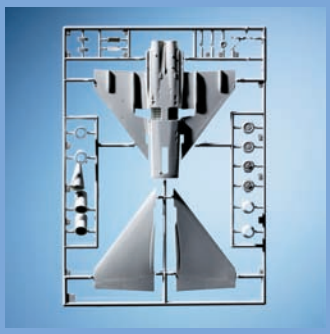
polymer IRC

Polymer Science & Technology

10 Day Modular Course
26th October – 6th November 2009
Novotel Sheffield



Polymer Science & Technology
10 Day Modular Course

IOM3 PD Approved

Polymer IRC

The Polymer IRC brings together skills and resources in macromolecular science and technology from leading academic institutions:

Universities of Bradford, Durham, Leeds and Sheffield.

It facilitates the building of effective multidisciplinary teams on the basis of scientific technological requirements. Core science and industrial collaboration are of equal importance.

Access to our expertise can be through:

- Training from one-day courses to degrees
- Consultancy and testing services
- Short-term development and feasibility projects
- Collaborative and sponsored research
- Licensing of technology and joint ventures for commercialisation

Polymer IRC Club

The IRC Industrial Club is one of the important mechanisms through which the IRC interacts with the Industrial polymer science base. It consists both of large, international companies with a broad research portfolio, and smaller companies with more focussed interests.

This is made possible through a graded subscription scheme that allows individual tailoring of benefits to your needs.

For further information about the Polymer IRC and club membership please contact Helen Clancy on h.e.clancy@leeds.ac.uk

or visit the web site at www.polymerirc.org/pages/HomePage

Intended audience

This course is designed for personnel with a need to know more about polymer science and technology and should appeal to those with some background in the sciences and who wish to broaden their horizons with a general overview of these topics. It has been approved by IOM3 for professional development.

This course is specifically for you if: you interact with polymer scientists (either as customers, suppliers or research and development teams); or you are commercial/engineering/production based and need to understand more about how your products and/or processes work.

Course Notes

Each participant will receive at the beginning of the course, a bound set of course notes and a CD of the same information.

Please note that we reserve the right to make changes to the course content and lecturers should it be necessary.

polymer IRC | IRC polymer engineering, University of Bradford | Durham University | University of Leeds | Polymer Centre Sheffield | polymer IRC club

bringing UK polymer researchers together

Basic Polymer Science (Part I) – Synthesis, Properties and Processing - Module Programme

Presenters: Professor J.R. Ebdon (JRE) and Dr B.J. Hunt (BJH)

09.30 - 10.00	**Registration Welcome and Tea/Coffee**	
10.00 - 10.50	Introduction	(JRE)
10.50 - 11.25	Structures and Molecular Weights	(BJH)
11.25 - 11.40	**Tea/Coffee**	
11.40 - 12.15	How Polymers are Made: Chain Reaction Polymerizations	(JRE)
12.15 - 12.50	Properties of Polymers: Thermal and Optical	(BJH)
12.50 - 13.30	**Lunch**	
13.30 - 14.05	How Polymers are Made: Step Reaction Polymerisations	(JRE)
14.05 - 14.40	Processing of Polymers	(BJH)
14.40 - 15.15	Properties of Polymers: Mechanical and Electrical	(JRE)
15.15 - 15.30	**Tea/Coffee**	
15.30 - 16.05	Properties of Polymers: Chemical and Solution	(BJH)
16.05 - 16.40	Specific Polymers and Applications	(JRE)
16.40 - 17.00	Question and Answer Session	
17.00	**Close**	

Module Objectives

This course is designed as an introduction to the subject of polymer science and gives an overview of how this applies to a wide range of materials, processes, products and applications. If your company works with plastics, rubbers, adhesives, composites, coatings, fibres or packaging and requires some basic knowledge about polymeric materials, or have a requirement to analyse or characterise their behaviour, then this course will benefit you.

Part I of this course will give you an introduction to the science underlying the synthesis and processing of polymers, some basic information about their structures and properties and present some examples of their applications.

In Part II of the course you will learn about the range of modern instrumental techniques which can be used to analyse the structure and behaviour of polymeric materials. It will give a more detailed and in-depth view of some of the topics briefly presented in part I.

Delegates can attend either of these modules independently but they are designed to complement one another and to give a comprehensive introduction to Polymer Science.

Basic Polymer Science (Part II) – Characterisation and Analysis – Module Programme

Presenters: Professor J.R. Ebdon (JRE) and Dr B.J. Hunt (BJH)

09.30 - 10.00	**Welcome and Tea/Coffee**	
10.00 - 10.45	Determination of Molecular Weight	(BJH))
10.45 - 11.30	NMR Spectroscopy	(JRE)
11.30 - 11.45	**Tea/Coffee**	
11.45 - 12.30	Thermal Analysis	(BJH)
12.30 - 13.15	IR/Raman Spectroscopy	(JRE)
13.15 - 14.00	**Lunch**	
14.00 - 14.45	Chromatographic Techniques	(BJH)
14.45 - 15.30	Other Techniques	(JRE)
15.30 - 15.45	**Tea/Coffee**	
15.45 - 16.30	Case Studies	(BJH/JRE)
16.30 - 17.00	Question and Answer session	
17.00	**Close**	

Module Objective

This course is designed as an introduction to the subject of polymer science and gives an overview of how this applies to a wide range of materials, processes, products and applications. If your company works with plastics, rubbers, adhesives, composites, coatings, fibres or packaging and requires some basic knowledge about polymeric materials, or have a requirement to analyse or characterise their behaviour, then this course will benefit you.

Part I of this course will give you an introduction to the science underlying the synthesis and processing of polymers, some basic information about their structures and properties and present some examples of their applications.

In Part II of the course you will learn about the range of modern instrumental techniques which can be used to analyse the structure and behaviour of polymeric materials. It will give a more detailed and in-depth view of some of the topics briefly presented in part I.

Delegates can attend either of these modules independently but they are designed to complement one another and to give a comprehensive introduction to Polymer Science.

Polymer Chemistry – Module Programme

Presenters: Dr. L.Hutchings (LRH) Dr.N.Cameron(NRC)

09.30-10.00	**Registration and Tea/Coffee**	
10.00-10.35	Chain Growth	(NRC)
10.35-11.10	Controlled Free Radical Polymerisation	(NRC)
11.10-11.25	**Tea/Coffee**	
11.25-12.00	Step Growth	(NRC)
12.00-12.35	Coordination Polymerisation (including ROMP)	(NRC)
12.35-13.35	**Lunch**	
13.35-14.10	Ionic Polymerisations	(LRH)
14.10-14.45	Dendrimers and Hyperbranched Systems	(LRH)
14.45-15.00	**Tea/Coffee**	
15.00-15.35	Polymer Chain Dimensions	(LRH)
15.35-16.10	The Glass Transition	(LRH)
16.10	**Close/Questions**	

Module Objective

This course builds upon the basic concepts of polymerisation introduced on day one. Synthetic techniques in common use in both academic and industrial laboratories for making a wide variety of polymers will be covered. Emerging methodologies that facilitate greater control over the final product, and as a consequence enable novel polymer architectures, will also be considered. The concepts of polymer chain dimensions and the glass transition temperature – both fundamental physical characteristics of polymers will also be introduced

If your company works with plastics, rubbers, resins, adhesives, composites, coatings, fibres or packaging, a good understanding of polymer chemistry will benefit you. This course will give you a deeper understanding and a good overview of the different aspects of polymer chemistry.

Polymer Engineering – Module Programme

Presenters: Dr M.T. Martyn (MTM) Dr A.L. Kelly (ALK)
Dr L. Mulvaney-Johnson (LMJ) Dr R. Patel (RP)
Dr P. Caton-Rose (PCR) Dr J. Sweeney (JS)

09.10 - 09.30	**Registration Welcome and Tea/Coffee**	
09.30 - 09.40	Welcome Introduction	(MTM)
09.40 - 10.25	Flow Behaviour of Polymer Melts	(MTM)
10.25 - 11.10	Extrusion Processing	(ALK)
11.10 - 11.20	**Tea/Coffee**	
11.20 - 12.05	Injection Moulding Technology	(LMJ)
12.05 - 12.50	Solid Phase Deformation Processing	(JS)
12.50 - 13.30	**Lunch**	
13.30 - 13.50	Laboratory Demonstration	(MTM)
13.50 - 14.10	Laboratory Demonstration	(MTM)
14.10 - 14.30	Laboratory Demonstration	
14.30 - 14.50	Laboratory Demonstration	
14.50 - 15.10	**Tea/Coffee/Questions**	
15.10 - 15.55	Computer Modelling of Melt Processing	(PCR)
15.55 - 16.40	Coating Technology	(RP)
16.40 - 17.00	**Close/Questions**	

Modules Objectives

The course is designed to introduce participants to established engineering principles underlying the conversion of polymer raw material to useful product. The course aims to bridge theoretical perspectives of polymer melt flow with practical experience. The course will cover both melt and solid state processing characteristics of polymers and demonstrate how these influence the choice of processing technologies used by industry. Computer modelling of process flows will also be covered.

This module will be held at Bradford University to allow demonstrations on the equipment there.

Polymer Physics – Module Programme

Presenters: Professor P. Olmsted (PO) Dr D. Read (DR)
Dr A. Voice (AV) Dr D. Adolf (DA) Dr M. Ries (MR)
Professor R.A.L. Jones (RALJ) Dr Sarah Harris (SH)

09.15-09.45	**Registration Welcome and Tea/Coffee**	
09.45-10.30	Rheology	(PO/DR)
10.30-11.15	Solid Polymers Mechanical Properties	(AV)
11.15-11.30	**Tea/Coffee**	
11.30-12.15	Basic Polymer Theory	(PO/DR)
12.15-13.00	Molecular Characterisation 1 (SLS,DLS)	(DA)
13.00-13.30	**Lunch**	
13.30-14.15	Molecular Characterisation 2 (NMR)	(MR)
14.15-15.00	Polymers in Solution (Gels, Polyelectrolytes)	(PO/DR)
15.00-15.15	**Tea/Coffee**	
15.15-16.00	Polymers at Surfaces	(RALJ)
16.00-16.45	Biopolymers	(SH)
16.45	**Close/Questions**	

Modules Objectives

This course is designed to be an introduction to Basic Polymer Physics, and will be complementary to those of Basic Polymer Science, Polymer Characterisation, Polymer Chemistry and Polymer Engineering. It will be a course covering a wide range of topics in polymer physics: amorphous polymers, crystalline polymers, characterisation, viscoelasticity, polymer rheology, and oriented polymers. It will be appropriate for those members of the general polymer community wishing to get an update of the current state of polymer physics.

Multi-Phase Polymer Materials and Composites – Module Programme

Presenters: Dr P. Hine (PJH) Professor F. Jones (FRJ)
Professor C. Soutis (CS) Professor T. McGrail (TM)

09.30 - 10.00	**Registration and Welcome**	
10.00 - 10.30	What is a fibre composite and multiphase polymeric material?	(PJH)
10.30 - 11.30	Fibre Composites – Rigidity	(FRJ)
11.30 - 11.40	**Coffee**	
11.40 - 12.30	Fabrication Routes to Fibre Composites	(FRJ/PJH)
12.30 - 13.15	Phase Separated Matrix Resins for Composites	(TM)
13.15 - 13.45	**Lunch**	
13.45 - 14.30	Particulate Reinforcements and Nano Composites	(PJH)
14.30 - 15.15	Continuous Fibre Composites: Strength	(FRJ)
15.15 - 15.30	**Tea/Coffee**	
15.30 - 16.00	Applications Workshop	(CS/SAH)
16.00 - 16.30	Round Table Discussion/further case study	
16.30	**Close**	

Module Objectives

This one day course is designed as an introduction to multiphase polymer materials and polymer based composites for newcomers to the subject. The course will cover the basic ideas of composite materials, of obtaining a material which improves on the properties of its constituents. Topics covered will include the reinforcement shape/type (continuous, discontinuous fibres, particulates), reinforcement size (the important emerging area of nanocomposites), matrix type (thermoplastic or thermoset), different processing routes (from hand lay-up to injection moulding) and composites where both phases are polymeric. The important area of mechanics of composites will also be covered, including aspects such as mixing rules, damage mechanisms and interfaces.

This course is specifically for you if: you are new to this technical area and want a basic grounding in polymer based composite materials; interact with polymer scientists (either as customers, suppliers or research and development teams); or if you are commercial/ engineering/product based and need to understand more about how your products and processes work.

Organic Electronics – Synthesis, Properties and Application in Devices - Module Programme

Presenters: Dr Alastair Buckley (AB), Dr Martin Grell (MG) and Dr Ahmed Iraqi (AI)

09.30 - 10.00	**Registration Welcome and Tea/Coffee**	
10.00 - 10.50	Introduction	(AI)
10.50 - 11.25	How conjugated polymers are made: Part I	(AI)
11.25 - 11.40	**Tea/Coffee**	
11.40 - 12.15	How conjugated polymers are made: Part II	(AI)
12.15 - 12.50	Applications of PEDOT/PSS and PANI derivatives	(MG)
12.50 - 13.30	**Lunch**	
13.30 - 14.05	Application in field effect transistors and sensors	(MG)
14.05 - 14.40	Application in solar cells	(MG)
14.40 - 15.15	Processing of organic semiconductors	(AB)
15.15 - 15.30	**Tea/Coffee**	
15.30 - 16.05	Transport and injection of charges in organic electronic devices	(AB)
16.05 - 16.40	OLED for information displays	(AB)
16.40 - 17.00	Question and Answer Session	
17.00	**Close**	

Module Objectives

The aim of this course is to give an overview on the design, preparation and uses of organic conjugated polymers and oligomers in the electronics industry and will focus on the factors governing their physical properties and their structure-property relationship in electronic device applications.

The course will start with an overview of electronically conjugated polymers and oligomers, with a particular reference to the origin of the semi-conducting properties of these materials. The course will then concentrate on the synthetic advances in the field of conjugated polymers and oligomers, their structure-property relationship and the design factors that should be taken into account for specific applications. The course will then deal with their applications in devices and the underlying physical properties required in specific applications. The use of these materials in devices such as light emitting diodes, field effect transistors and solar cells will be highlighted.

Polymeric Biomaterials – Module Programme

Presenters: Dr S. Rimmer

09.30 - 10.00	**Registration Welcome and Tea/Coffee**
10.00 - 11.00	Current Polymeric Biomaterials in the Field
11.00 - 11.15	**Tea/Coffee**
11.15 - 11.45	Synthesis and Fabrication 1–Polyurethanes, Polyesters, Polyamides
11.45 - 12.15	Synthesis and Fabrication 2–Acrylics, Vinylics and Hydrogels
12.15 - 12.45	Synthesis and Fabrication 3–Low Surface Energy Materials (Polysiloxanes and Fluoropolymers)
12.45 - 14.00	**Lunch**
14.00 - 14.30	Synthesis and Fabrication 4–Plasma Polymerisation and Surface Treatments
14.30 - 15.00	Introduction to Biointeractions
15.00 - 15.30	Studying Biointeractions
15.30 - 15.45	**Tea/Coffee**
15.45 - 16.15	Surface Analysis of Polymeric Biomaterials
16.15 - 16.45	Introduction to Biodegradation
16.45 - 17.15	Emerging Fields-Polymers in Tissue Engineering and Drug Delivery
17.15	**Close/Questions**

Module Objective

The course will overview the types of synthetic materials used the in medical applications of polymers. We begin with an overview of the field by covering the types of applications that polymeric biomaterials are used in today. We then look in detail at the various classes of materials considering aspects of their synthesis, fabrication and properties that make them suitable for medical applications. Characterization of the interface between the biological system and the synthetic material is a vital area of consideration so we will consider the techniques that we have available to examine these biointeractions. Finally we will consider emerging areas of medical technology that are becoming more reliant on polymers: we consider the current approaches and briefly highlight some of the state-of-the-art newer systems.

Polymer Nanotechnology – Module Programme

Presenters: Professor A.J. Ryan (AJR)
Professor R.A.L. Jones (RALJ)

09.30 - 10.00	**Registration Welcome and Tea/Coffee**
10.00 - 10.15	Welcome and Introduction
10.15 - 10.45	Introduction and Context
10.45 - 11.15	Synthesis of Controlled Architecture Polymers
11.15 - 11.30	**Tea/Coffee**
11.30 - 12.00	Characterisation of Morphology
12.00 - 12.30	Block Copolymers 1
12.30 - 13.00	Polymer Surfaces and Interfaces
13.00 - 13.30	**Lunch**
13.30 - 14.00	Block Copolymers 2
14.00 - 14.30	Polymer Electronics
14.30 - 15.00	Polymer Photonics
15.00 - 15.15	**Tea/Coffee**
15.15 - 15.45	Responsive Systems
15.45 - 16.15	Summary and Outlook
16.15	**Close/Questions**

Module Objectives

This course is designed to introduce the subject of polymer nanotechnology and gives an overview of how this applies to a wide range of nanotechnology applications. It will demonstrate how this knowledge can be used to better develop new nanotechnology devices, processes and new business opportunities.

Polymer Dynamics and Macromolecular Rheology – Module Programme

Presenters: Dr. D. Read and Professor P.D Olmsted

09.30-10.00	**Registration Welcome and Tea/Coffee**
10.00-10.45	Fundamentals of Polymer Molecular Rheology
10.45-11.30	The Rouse Model and Results
11.30-11.45	**Tea/Coffee**
11.45-12.30	Polymer Solutions and Hydrodynamics
12.30-13.30	**Lunch and Demonstrations**
13.30-14.15	Surfactant Systems
14.15-15.00	Entangled Dynamics and Complex Architecture Molecules
15.00-15.15	**Tea/Coffee**
15.15-16.00	Applications of Controlled Rheology
16.00	**Workshop/Discussions**

Module Objectives

A course aimed at industrial scientists interested in molecular formulations/rheology/controlled processing in plastics/surfactant fluids.

The module covers the basic physics of polymer dynamics and rheology, aimed at assisting projects that design formulations of polymer-containing fluids with controlled flow, adhesion or lubrication. The applications section can be tailored to individual audiences. Mathematical content is kept to a minimum, but useful scaling formulae are derived.

Polymer Science and Technology – 10 Day Modular Course

Polymer IRC

Please register me for the above 10 day modular course

Name: .....

Organisation: .....

Address: .....

.....

Tel: ..... Fax: .....

e-mail: .....

Please tick as appropriate. You may attend the whole 10 days or alternatively select the daily options.

- ☐ Polymer Science and Technology – 10 Day course (Course fee £2250)
- ☐ Day 1 - Basic Polymer Science Part I (Course fee £330)
- ☐ Day 2 - Basic Polymer Science part II (Course fee £330)
- ☐ Day 3 - Polymer Chemistry (Course fee £330)
- ☐ Day 4 - Polymer Engineering (Course fee £330)
- ☐ Day 5 - Polymer Physics (Course fee £330)
- ☐ Day 6 - Multiphase Polymer Materials & Composites (Course fee £330)
- ☐ Day 7 - Organic Electronics (Course fee £330)
- ☐ Day 8 - Polymeric Biomaterials (Course fee £330)
- ☐ Day 9 - Introduction to Polymer Nanotechnology (Course fee £330)
- ☐ Day 10 - Polymer Dynamics & Macromolecular Rheology (Course fee £330)

The above fees are not subject to VAT

Price on application for reduction of fees for multiple days or multiple delegates

I would prefer to pay by **cheque** ☐ **credit card** ☐ **bank transfer** ☐

Further details provided upon receipt of booking

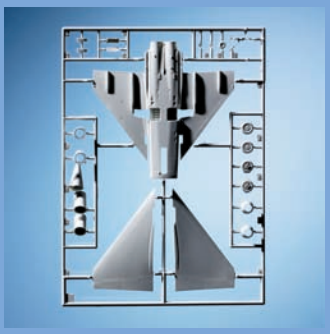
A charge of 25% will be made for cancellations received after 1st October 2009

Please return this slip (or send details) to:

Miss S.H. Cowley The Polymer Centre, Dainton Building, University of Sheffield, Sheffield S3 7HF (Tel: 0114 222 9520)

Or fax to 0114 222 9389 or e-mail details to s.h.cowley@sheffield.ac.uk

Polymer Science & Technology



Polymer Science & Technology

10 Day Modular Course | 26th October – 6th November 2009 | Novotel Sheffield