

Level 5 Modules: Advanced

Module Title & Description	Module	Average Completion Time (Hrs)	BCF Member*	Non - Member*
<p>Pigments Colour and Dispersion</p> <p>This module is concerned with a number of important aspects of pigments. In the first section, various ways of describing colour are presented, in scientific terms. Both the Munsell and CIELAB systems are covered and terms such as tristimulus values, 2° and 10° observers, dominant wavelength, L, a, b values and total colour difference are explained. The second section describes the manufacture and properties of a selection of important inorganic and organic pigments. In particular, a range of coloured organic pigments is dealt with in some detail, along with flow diagrams for the production of TiO₂, by two different methods. In the third section the important area of pigment dispersion stability is studied. This is vital to avoid the process known as pigment flocculation. This is important during coatings manufacture, when a pigment millbase is to be converted into the finished paint and there is a danger of destabilisation of the dispersion. The efficiency of pigment dispersion is described. This includes a general flow chart for manufacture. The relationship between dispersion efficiency and operating economics of a plant is explained. Finally, the efficiency of various types of dispersion machinery is described in terms of both dispersion time and labour requirements.</p>	501	10	£415	£575
<p>Evaluation and Specification</p> <p>This module aims to provide the student with guidelines on how to design a test method which will enable a coating to be produced to meet the full requirements of the customer. In order to reach this stage we shall be discussing the problems relating to the evaluation of coating films, what is meant by the terms 'standards' and 'test methods' and what could be the important components of the specification. There have already been a number of modules at Foundation and Intermediate level dealing with test methods, so this module will refer to these, and then add others that may be of help. The student will be required to produce a suitable test specification as an assignment at the end of the theory material.</p>	502	10	£415	£575
<p>Formulation - Determining Factors</p> <p>This paper is one of a series of Advanced Modules, which consider various aspects of product formulation. When formulating a surface coating, the Coatings Chemists will need to take account of a number of outside constraints, any of which may affect the final formulation. For example performance specifications, application techniques and the nature of the substrate must all be taken into consideration when deciding on the optimum surface coatings. Health & Safety or environmental issues increasingly limit that choice. This Module investigates the various factors affecting the selection of a coating. Note: It is assumed that the student already has a thorough grounding in the basis of coating technology and an understanding of the chemistry involved.</p>	503	11	£415	£575
<p>System Components - Decorative Applications</p> <p>This Module contains a comprehensive study of the individual coatings used in a coating system. After explaining the basic function/requirements of the individual coatings, the module goes on to give the basic principles used in formulating these coatings, with particular attention to the pigment volume concentration (PVC) concept. Finally, the concept and impact of the "critical pigment volume concentration" (CPVC) is discussed. As adhesion to the substrate* is usually a critical factor in determining the performance of a coating system, different substrates and their properties are discussed in the first section of the module, particularly mild-steel, wood and plaster. It should be noted that the module is designed to cover a wide range of possible end requirements, and is therefore written in a general sense. However, the student will be expected to demonstrate an understanding of the concepts explained by carrying out the Assignment-which can be tailored to reflect a topic in which the student (or the students company) may have particular expertise.</p> <p>* The substrate is the surface onto which a coating is applied.</p>	504	9	£415	£575
<p>Industrial Coatings for Automotive and Packaging Applications</p> <p>In this Advanced Module the basic formulations requirements of coatings for use on automotives, both original factory finished and for vehicle refinishing, are given. A typical automotive paint line is described and examples of specifications for paints are given. Formulations of typical paints together with explanations of the components are then given. Under vehicle refinishes formulation requirements the resin types used are outlined with comparisons in performance of different paint systems. Basic requirements of linings for good and beverage containers are given. The formation of cans is described with descriptions of suitable application methods. Performance requirements of can coatings are listed with reference to a range of typical products they are required to resist. Examples of resin types used in can coatings with comparisons of their properties are listed. The module concludes with the testing and evaluation of the coated cans.</p>	506	12	£415	£575

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<p>Liquid Coatings, Modifiers and Drying</p> <p>This Module is one of three advanced modules dealing with additives used in surface coatings. Additives can be considered to be materials which, when added to another substance, improve the overall properties or reduce undesirable properties. In most cases, the level of addition is less than one percent. This module contains a comprehensive study of certain additives including why they are required and how they work.</p> <p>In section 1 of the module, factors that affect the dispersion process are discussed. An explanation is given on how certain manufacturing problems are caused and how they can be avoided. Specific topics include "foams" wetting, dispersion, flooding and floating.</p> <p>Section 2 describes materials that can be classified as stabilisers, with particular attention to "in-can" fungicides, and corrosion preventers.</p> <p>In the final section, modifiers to the polymerisation process are discussed. In particular, we are referring to the drying process of oil-based alkyds. The drying mechanism is fully explained, and certain "driers" discussed, along with their function and approximate levels of use. Anti-skinning additives are also discussed in some depth.</p> <p>It should be noted that additives that induce thixotropy (and therefore reduce settlement) are discussed briefly in this section. However, for students wishing to study the subject of "rheology" thoroughly, we would recommend module A08, which contains a greater "in-depth" study of this particular subject.</p>	507	11	£415	£575
<p>Application and Special Properties</p> <p>This module is one of three advanced level modules dealing with additives used in surface coatings. Additives can be considered to be materials which, when added to another substance, improve the overall properties or reduces undesirable properties.</p> <p>This module discusses the reasons for controlling the viscosity of a coating to aid its application properties and the types of additives used for this purpose. It then goes on to explain the types of additive used to control or promote flow.</p> <p>After this, the need to control the conductivity of paints to be applied by electrostatic methods is considered and the special problems associated with the addition and stability of conductivity controllers discussed. Types of conductivity controller are then listed.</p> <p>The module then explains why reodorants are sometimes used in coatings and examples of commercially available products of this type are given.</p> <p>A discussion on flash point modifiers is followed by a list of typical classes of these products and a discussion of their merits provided.</p> <p>Finally, the nature and use of fire-retardant and intumescent coatings are discussed with regard to their special properties.</p>	508	11	£415	£575
<p>Appearance and Properties</p> <p>The first Section of this advanced module is concerned with additives which modify the appearance of dry films e.g. finishes such as hammer and wrinkle. We go on to study the various types of surface-active agents which are so important in determining the properties of dispersions. Also in the Section, we look at the importance of anti-foams, texturing agents and matting agents. The problem of gas checking and ways of overcoming it are also discussed.</p> <p>In Section 2, we turn to additives used to modify the properties of dry films. Additives such as adhesion promoters, heat stabilisers, lubricants, anti-scuff agents anti-fouling additives and other biocides, corrosion inhibitors and finally, ultra-violet absorbers.</p> <p>The final Section is devoted to film plasticisers. Here we look generally at the background, the effect of plasticisers on film strength, flexibility and hardness. Finally, the various types of plasticiser are covered in some detail, including their chemical formulae.</p>	509	11	£415	£575
<p>Urethane and Amino Resins</p> <p>In this Advanced Module Polyurethane Resins and Amino Resins are discussed in more detail than in Intermediate Modules 509 and 508 respectively.</p> <p>Described are the structure of isocyanate monomers and the preparation of pre-polymers from them. Also discussed are the hazards involved in the handling and use of isocyanates. Their use in the preparation of the 5 major types of urethane coatings is explained. Their characteristics and applications are then discussed.</p> <p>The functional groups in amino resins based on urea and melamine are shown and the structure of benzoguanamine given. Applications of these amino resins are given.</p>	510	9	£415	£575

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<p>Epoxy, Acrylic and Water Reducible Resins</p> <p>In this Advanced Module Epoxy Resins and Acrylic Resins are discussed in more detail than in Intermediate Modules 509 and 508 respectively.</p> <p>In the section on epoxy resins, methods of quoting epoxide content of a resin is explained together with the significance of 'oil length' of an epoxy ester. Reactions between epoxy resins and phenolic, amino and polyamide resins and with amines are also described.</p> <p>The section on acrylic resins concentrates on thermosetting resins and the monomers required in their formulation.</p> <p>Also in this Module is a section on water reducible resins including emulsions and methods of making solutions of different types of resin with varying degrees of water reducibility or solubility.</p>	511	9	£415	£575
<p>Water Borne Coatings</p> <p>This module discusses water borne products, coatings with water as the main volatile component, are referred to in a number of the BCF Technical Certificate modules. The growing importance of this type of coating has resulted in a demand for a module dealing specifically with water borne coatings. This unit is designed to meet this demand.</p> <p>The module summarises the existing technology involved in the formulation, manufacture and use of water borne coatings and includes possible future developments.</p> <p>It begins by discussing the history of water borne coatings, explains the reasons for their increasing use and describes their general properties in comparison with non-water borne products.</p> <p>Relevant legislation relating to the volatile content of coatings is referred to and explained.</p> <p>The module continues with a discussion on the principal methods available to make water borne film formers for use in coatings before describing specific types of water borne coating, their properties and applications. These discussions include both solution and dispersion types.</p> <p>The final section is devoted to possible future trends.</p>	512	11	£415	£575
<p>Thermosetting Coating Powders</p> <p>This module investigates the various media used to manufacture thermosetting coating powders, the chemistry involved and some of the important factors that affect the formulation process.</p> <p>Special attention is paid to the use of additives in optimising the manufacture, application and performance of the products. The final Section considers recent innovations such as thin films powders and those systems cured by combined IR/UV radiation or other low temperature techniques.</p> <p>Note: it is assumed that the student already has a thorough grounding in powder technology and some understanding of basic chemistry. Module 204 gives an overview of Powder Coatings and Module 311 describes the more common resin systems used in their manufacture.</p>	513	9	£415	£575
<p>Coatings Powders - Manufacture</p> <p>In this Advanced Module we investigate in depth some of the important factors that need to be controlled when making thermosetting powders. To keep products and processes within specification, coating chemists and production staff need to think on their feet recognising and correcting quality issues as they arise.</p> <p>We also discuss the design and layout of a production unit and the economics of the process.</p> <p>Note: It is assumed that the student already has a thorough grounding in the basics of powder manufacturing technology. Module 207 gives an overview of powder coatings and 327 expands on the manufacturing processes.</p>	514	9	£415	£575

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<p>Thin Film Intumescent Coatings for Fire Protection of Steel</p> <p>This Advanced Module deals with thin film intumescent coatings used for the fire protection of steel surfaces. It commences with an explanation of what we mean by an intumescent coating, and introduces the generic raw material types typically used in the formulation of both water-based and solvent-based coatings. This is followed by an indication of how these coatings are tested. The application of these products is then discussed before proceeding to a comparison of various forms of fire protection. The final section of the module provides a summary of the subject of thin film intumescent coatings.</p> <p>This module is intended for anyone requiring an understanding of intumescent coatings whether they are the formulator or other laboratory personnel, raw-material supplier, applicator, salesperson architect or specifier - or indeed anyone with an interest in the subject!</p> <p>The module is designed to cover a wide range of topics associated with thin-film intumescent coatings and, depending on their needs and background, some students may find some sections more useful or appropriate than others.</p> <p>As the module is set at advanced level, we would expect the student to have some knowledge of chemistry and physics and some basic knowledge of intumescent coatings.</p> <p>Note: Intumescent coatings are introduced in the intermediate level module 403, where raw materials used specifically in intumescent coatings are discussed under the umbrella of "additives".</p>	515	10	£415	£575
<p>General Overview of Inkjet</p> <p>The inkjet is a non-contact printing technology in which the droplets get ejected through the small orifices onto the substrate. It is a digital technology as the image to be printed is normally kept in a digital format. DOD (PIJ, TIJ, VIJ) - Drop On Demand CIJ - Continuous InkJet</p> <p>Initially, inkjet DOD printing dominated SOHO printing markets, but with the printing of the photos and documents disappearing, this market is rapidly declining with inkjet getting a more and more significant role in commercial/business printing applications. It is displacing silkscreen, rotary screen & offset applications and with an increase of the speed even dome flexo applications. Inkjet has been used for a long time in variable data printing such as date, coding, naming, addressing, barcoding and postal applications but now it is overtaking wide format poster and product decoration textile, ceramic tiles, wallpaper, laminates, furniture applications. It is quickly becoming a preferred technique for digital presses. Full-colour packaging, printed electronics are some of the examples where inkjet has proven itself as a reliable technology.</p>	516	10	£415	£575
<p>Advanced Level Formulation Project</p> <p>This module is an Advanced Level Formulation Project. This is intended as the very last exercise for anyone wishing to achieve the full technical certificate in coatings at Level 5. The candidate will carry out a piece of work - a project - involving all of the procedures described in this module.</p> <p>Note: Submission must be within 6 months of commencement of the module.</p>	599	-	£415	£575

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