

ECT Teacher Training Programme

ECT Programme

Introduction

This document outlines the ECT accredited teacher training programme, which is the key element of the ECT project. The same programme is also available to trainee teachers. The other elements are the accredited trainers programme, which accredits people to run these courses; the ECT website (www.ectinschool.org), which supports teachers and their students and the provision of some resources.

Information and communications technology (ICT) dominates many aspects of most of our lives. It plays a significant role in business, industry and in education. Over the past twenty years there has been a significant move towards ICT resources being used to make all of our lives more effective, productive and interesting. No one doubts the growing influence of ICT in the world but our education system has made little significant effort to educate young people in the basic skills that underpin the emerging technologies. These skills are related to what is becoming known as electronics and communications technology (ECT). There has been little national or local effort in the past decade to train teachers, provide resources for teaching or to promote this as an important aspect of education that was available for our young people in schools. Thus in 2003 only about 18 percent of our secondary schools offered courses in electronics, and even a significant number of our specialist technology colleges did not offer such courses. This figure has remained unchanged for the last 5 years.

ECT impacts on our lives in a countless number of ways, ranging from our everyday use of heating, lighting and water systems, to our interactions with systems which control power, financial systems, computers, communications, motor vehicles and transportation. ECT cannot be avoided in a modern world and neither should our understanding of it.

The ECT Project is an ambitious attempt to address this need to interest and educate a significantly larger number of young people in ECT. The intention is that this will increase the level of technological literacy in ECT. The ECT Project aims to encourage young people to consider working in this dynamic sector of industry that needs able young people who can develop, service and maintain the increasingly complex electronic highways and control systems that are the key building blocks of a modern technological society.

By participating in the ECT Project teachers will be helping students in schools gain a better understanding of the world in which they live. They will enable their students to understand the technology and help them to make decisions about the use of the ECT in their lives and help them to be better informed citizens. Furthermore it will help address what the DfES/DTI studies shows to be one of the largest areas of skill shortage in the UK.

The key objectives of the ECT project, arising out of this are:

- to improve the quality of teaching and learning in electronics, control and communications technology in secondary schools.
- to increase the number of students studying electronics and communications technology in schools at both Key Stage 3 and Key Stage 4 and hence into post-16 courses.
- to improve the quantity and quality of applications into higher education courses where electronics, control and communications technology form a major part of their courses of study.

The training outcomes will be accredited by DATA with a certificate of competence in ECT endorsed by the DfES, DTI, IEE and TEP. The competencies will cover a wide range of areas of work and will become part of a teacher's continuing professional development portfolio. This will enable the teacher and their students to have full access to the ECT website (www.ectinschools.org), which has been designed as a comprehensive website for teaching and learning in ECT. DATA will also set criteria to be fulfilled that allow schools to sign up to be an 'ECT School' with logo branding and certification for the school. This should raise the profile of the scheme with schools and governors, raise the profile of ECT and design and technology. (see Appendix A for the complete set of competencies).

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Who can deliver the course?

The only person who is authorised to deliver and accredited under this course is an **ECT Accredited Trainer**. They are authorised to allow teachers and their students to have full access to the website and ECT school status. The accredited trainers have all successfully completed an eight-day training course over a four-month period and have completed 3 assignments, including a major action research activity in ECT, as well as carrying out a series of presentations. An accredited trainer is only licensed for one year, and to gain re-accreditation they have to show evidence of keeping up to date, and can provide evidence of successful training. In addition on receiving their accreditation a teacher is expected to then complete an evaluation form related to the quality of the training. The accredited trainers course and subsequent training undertaken by them is subject to the same rigorous quality assurance procedures as apply to the teacher training course format.

All accredited trainers have access to a **course manual**, which is available in both paper and electronic format. DATA hold the copyright of this manual, but any accredited trainer has the right to copy the document for the purpose of the ECT training. However, it or any parts must not be published without the permission of DATA. Clearly accredited trainers may wish to modify the document for their own purpose.

Who can take part in this course?

The teacher training course, outlined here, is open to any serving teacher with an interest in teaching electronics, who can seek approval from the schools senior management to continue to teach electronics or to plan to offer a course in electronics within the following 12 months. Head teachers are expected to make this commitment if central funding is offered. It is also offered to trainee teachers who can receive the accreditation. On starting their professional career they will maintain their access to the full website for two years, to maintain the access after that period they will need to inform DATA that they are teaching electronics in the school where they work.

The status of ECT School is transferable with the accredited teacher, but can only be used in schools that teach electronics. Schools that lose the accredited teacher must notify DATA, who will leave website access for a period of six months while the school trains another member of staff.

Course assignments and assessments

The assignments are the routes through which teachers will be able to demonstrate their confidence and competence when working in the area of electronics, control and communications technology. By successfully completing a number of assignments teachers will have demonstrated to their ECT accredited trainer and, more importantly, to themselves that they are comfortable working, with and applying, a wide range of new technologies.

The assignments are an integral part of the teacher CPD routes and are woven into the structure of the ECT Website. The range of competencies, which will be 'assessed' through the assignments, represent the knowledge, skills, understanding that teachers will need to demonstrate as they work through the materials as part of their professional development programme. The assignments are also there to ensure that a degree of standardisation in the quality of confidence and competence is maintained. On successful completion of the assignments you will become a fully accredited **ECT Teacher** and your school will become an **ECT School**. This can only be awarded if, in the view of your ECT accredited trainer, you have met the standards for quality, understanding and application in the assignments you have undertaken. For course members who feel they have been incorrectly assessed there is an appeal system, and this will be through a written appeal address to DATA. DATA will seek to deal with the appeal through external assessors.

Course participants undertake **3 assignments**: 1 - specific knowledge and skills in ECT; 2 - pedagogic issues; 3 - designing and making teaching activity, which is integrative in nature, provides opportunities for reflection and allows you to demonstrate a wide range of skills and techniques. Assignments 1 and 2 will be undertaken during the first two days of the course.

The accredited trainer who will act as mentor/tutor to the course participant will, as part of the quality assurance procedure for the course, ensure that the teacher fulfils the requirements of the course and meets the appropriate competency standards set out in the appendix to this report.

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The Website - www.ectinschools.org.uk

A comprehensive website has been developed to support the teachers through the course and to provide both teacher and student material for promoting ECT in the classroom. The website is an integral part of the training programme and course members are encouraged not only to use the website in their teaching but also for their continuing professional development and maintaining contacts with other colleagues. Course members are also encouraged to contribute materials to the website arising from their own work and any materials generated by the course members are subject to quality assurance procedures and may be used to enhance the content of the website work in schools.

The structure of the website

The information on the website is based around a number of sections. All the sections are inter-related and there are links from and to each area. Much of the information described below will be available to both teachers and students of participating schools.

ECT in society	This section will illustrate ECT in a number of contexts reflecting the pervasive use of electronics in society.
Designing, developing and manufacturing ECT systems	The sub sections in this module are intended to take the teacher, in a progressive way, through ECT concepts and content from systems design to manufacture. The material takes into account the teachers' starting points and providing a progressive route through the ECT concepts identified. This section also looks at design issues in relation to ECT products.
Using ECT	The subsections in this section will feature activities, which are primarily intended for teachers to learn about specific current and emerging technology. They may also be used to direct students' learning about that technology.
ECT activities	Teachers will be able to access a large number of student activities. They will have been written so that they may be implemented within the classroom with the minimum of change.
ECT teacher case studies	A number of case studies have been written illustrating how colleagues in schools have implemented an ECT curriculum in key stages 3 and 4
Pedagogic issues in ECT	The materials in the subsections within this section cover the many issues, which teachers need to consider when they develop ECT activities within the classroom – progression, continuity, breadth of experience, resource and project management etc
Teacher CPD routes	This section contains all the information for teacher to use to plan their professional development routes.
ECT Datafile	The ECT Datafile contains detailed information about electronic subsystems and will help both teachers and students in their ECT designs
Glossary	This contains an alphabetic list of common words and phrases used within ECT systems. Each is accompanied by a brief description and in some cases there is guidance on where to find further information

All materials commissioned for the website are subject to quality assurance procedures - many are peer reviewed and most are subjected to scrutiny by practising classroom teachers.

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The 'needs analysis'

The training programme has been carefully designed to fulfil teachers' professional development needs. Before attending the course, all teachers are asked to complete a comprehensive needs analysis proforma that is used to identify those areas of ECT where they feel they need to make progress. During the four days (24hrs) of face-to-face contact teachers will have the opportunity to clarify those needs and identify a number of specific actions that need to be taken. The accredited trainers/mentors will take into account any specific needs that arise from this analysis when they finalise the structure of the professional development programme.

After the initial four days (24hrs) face-to-face contact as part of the project teachers will be expected to use the ECT Website to help them complete any professional actions. The course member is encouraged to keep their needs analysis under constant review and the accredited trainer will act as a prompt to encourage this continual review.

The structure of the professional development course

Teachers can follow two basic routes through the 4 modules. These routes, for want of better titles, are called 'Starting out in electronics' and 'Taking electronics further'.

The 'Starting out in electronics' route is designed for those teachers who have never taught electronics but wish to introduce electronics into the KS3 curriculum. The 'Taking electronics further' route is for those teachers who have some electronics experience but wish to extend their knowledge and understanding and develop their designing and making skills in this area. Whichever route is followed the emphasis is on being able to take away from the course an activity that can be readily transferred into the classroom and materials and resources for immediate classroom use.

The four-day training package is the preferred model (route 1 or route 2) but there could be an option for teachers to opt to do either days 1 and 2 and/or 3 & 4 and still receive ECT accreditation provided they could prove they met all of the desired competencies.

Prior to the course: (4-6 weeks before)

- Letters to headteachers inviting them to nominate teachers from the design and technology department
- Schools and teachers are identified
- Letters to headteachers with further details of the professional development including the school's and teacher's commitments
- Teacher professional development needs identified through needs analysis proforma
- Pre-reading and initial tasks or brief assignments sent to course participants

Route 1: Day 1

Introduction to the purpose and aspects of the professional development
Outline of the course and general arrangements
The why, what, where and when of ECT in the curriculum
Needs analysis review and reflection on situation in participants' own schools (see application forms)
Personal / department action plan agreed
Outline of the assignments and accreditation routes
Outline of the assignment for the day
Practical activities using various simple PIC micro-processor systems – introduce at least 2 from a range of different systems. eg
 PICAXE
 PICLogicator
 Kids Chip
 Chip Factory
 ICON
How to connect output devices / how to drive output devices
How to solder
How to connect input devices / how to make an input sensor

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Explore the associated pedagogic issues
Undertake a simple practical project using a PIC system (some suggestions will be issued)
Ensure that course members leave with outline of a workable classroom activity

Exploring the website - Usernames / Passwords / Forum
Complete first assignment and review needs analysis
Outline of the support structure
End of session

Route 1: Day 2

Introduction to the day
Review of school based projects which use discrete building blocks and/or PIC systems
Some basic electronics using (eg):
 Control Studio
 Crocodile Clips/Technology
 Livewire
 Bright Sparks
Outline of the assignment for the day
A brief review of any new materials – as input or output devices (if appropriate)
Practical activities using various systems design software
Pedagogic issues related to planning ECT activities
Plan an ECT activity
Use software to help create teaching and learning aids
Complete second assignment and review needs analysis
Agree targets and routes
Teachers select kit from a list of resources to undertake class-based activity
End of session

Route 2: Day 1

Introduction to the purpose and aspects of the professional development
Outline of the course and general arrangements
The why, what, where and when of ECT in the curriculum
Needs analysis review and reflection on situation in participants' own schools (see application forms)
Personal / department action plan agreed
Outline of the assignments and accreditation routes
Outline of the assignment for the day
Practical activities using various simple PIC micro-processor systems – use at least 2 from a range of different systems. eg
 PICAXE
 PICLogicator
 Kids Chip
 Chip Factory
 ICON
Taking the hardware/software further – exploring other and more complex functions
Undertake a sophisticated practical project(s) using a PIC system (some suggestions will be issued)
Explore the associated pedagogic issues
Ensure that course members leave with outline of a workable classroom activity
Exploring the website - Usernames / Passwords / Forum
Complete first assignment and review needs analysis
Outline of the support structure
End of session

Route 2 : Day 2

Introduction to the day
Further practical activities using various simple PIC micro-processor systems
Taking the hardware/software further – exploring other and more complex functions

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Undertake practical project(s) using a PIC system (some suggestions will be issued)
Making your own PIC based systems – looking at manufacturing techniques
Ensure that course members leave with outline of a workable PIC system
Plan an ECT activity
Ensure that course members leave with outline of a workable classroom activity
Pedagogic issues related to making PIC systems and using them in ECT activities
Complete second assignment and review needs analysis
Agree targets and routes
Teachers select kit from a list of resources to undertake class-based activity
End of session

Route 1 and Route 2: Day 3

Review progress in schools on ECT activities tried and assignments undertaken
Looking at systems and sub-systems and their functionality
Product analysis – understanding electronic products
Product analysis and designing ECT systems
The differences and similarities between PIC software functions and stand-alone functional building blocks eg :
 Logic
 Comparing
 Latching
 Counting
Manufacturing ECT systems – using ICT applications
The systems approach to the use of test equipment and fault-finding
Manufacturing a PIC based system
Planning project work in school

Route 1 and Route 2: Day 4

Some further electronics and/or re-visiting earlier sub-systems
Further use of PIC technology and/or discrete building blocks in ECT projects
Product analysis and designing ECT systems continued
Planning project work in school to be completed
Pedagogic issues reviewed
Review of assignments and timescale
Summary course evaluation
The way forward - networking

Further information on some of the issues to be dealt with during the four days (e.g. pedagogy, content, assignments, classroom activities) are to be found on the ECT website – www.ectinschools.org.

After the course

- Assignment 3 related to a designing and making teaching activity, which is integrative in nature, provides opportunities for reflection and allows you to demonstrate a wide range of skills and techniques; to be started on the course and completed within 2 months
- On-line and other support from accredited trainer
- Action plan for ECT completed and in place

Accreditation

- On successful completion of each assignment a number of competencies will be banked.
- On completion of three assignments full accreditation will be awarded to the teacher.
- On signature of the competencies and the forwarding of these and the school action plan the teacher and school will receive full accreditation and certification.

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Appendix A

Summary of attainment of course members:

As a result of participating in the “ECT Project”, the course member is a more confident and competent classroom practitioner within the following areas of electronics and communications technology. The statements represent a summary of where the course member has been able to demonstrate improvements in their skills, knowledge and understanding and in their management of ECT activities.

1. Competency area - ECT Systems	
The course member has demonstrated an understanding of:	
- systems terminology (input, process, output and feedback) and matching sub-systems	
- electronic functions including comparators, timing circuits, counters, logic and amplifiers	
- the design of simple sensors and the function of a range of output transducers	
- the differences between, and applications of, analogue and digital systems	
- the principles and uses of programmable systems	
- the properties and applications of different communications media	
2. Competency area - Components in ECT systems	
The course member has demonstrated an understanding of:	
- components, their BS 3939 circuit symbols and the use of units (M, k, m, μ , n and p)	
- resistance, potential difference, voltage, current, analogue and digital signals	
- how to calculate component values and choose components (eg resistors, transistors)	
- the properties and uses of diodes, thyristors and transistors	
- the properties and uses of input sensors (LDRs, thermistors, potentiometers, switches)	
- the properties and uses of output devices (LED's, motors, buzzers, relays, loudspeakers)	
- basic signal conditioning (e.g. matching circuits, debounce signals)	
- the basic properties of some opto-electronic devices (reflective, slotted opto-switches)	
3. Competency area - Designing and making ECT solutions	
The course member has demonstrated an understanding of and improved capability in:	
- an analysis of existing electronic products in terms of inputs, processes, outputs	
- an analysis of the requirements of an electronic system in terms of inputs, processes, outputs	
- the use of a systems approach in the designing and modelling of electronic systems	
- the design and manufacture of ECT systems including testing performance of systems and sub-systems	
- using ICT and a range of test equipment with due regard to safety	

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4. Competency area - Using ICT within the designing and making of ECT solutions	
The course member has demonstrated an understanding of and improved capability in:	
- the use of software to generate schematics and PCB artwork	
- the use of circuit simulation and testing software to develop, explore and test ECT systems	
- the use of CAD and CAD/CAM software and hardware to design and make printed circuit boards	
- designing/modelling control systems (by flowcharts, textual commands, or graphical techniques)	
- the use of computer and micro-controller applications to control ECT systems	

5. Competency area - Skills related to Management of ECT Related Activities	
Course members are more able to:	
- manage a working environment and develop safe practices when working within ECT activities	
- appreciate a range of teaching and learning strategies appropriate to ECT activities	
- plan, develop, teach and evaluate ECT activities	
- guide students in their own project management	
- develop and use cross curricular links as appropriate	
- involve D&T staff in the processes of long, medium and short term planning for ECT activities.	
- secure and sustain effective teaching within ECT activities	
- develop and maintain ECT resources and provide value for money	
- ensure a safe working environment and be aware of the need to conduct risk assessments	

As you work through the assignments as part of your professional development with the ECT project, you should be able to 'tick off' those competencies in this checklist that you feel confident and competent about. You will need to have discussed and agreed these with your ECT accredited trainer beforehand.

Certificate of Competence in ECT

Name (Print) has been trained by an ECT Accredited Trainer, and meets the competences set out above.

Name of ECT Accredited Trainer

Signed Date / /

The accredited trainer signing this document is agreeing the teacher has met these competencies and on that basis the teacher will be accredited as an accredited teacher, with their school being given ECT School status and full access to the ECT website for all students within that school.

A completed ECT action plan, signed by the Headteacher/Principal needs to be returned with this document to Emma Gillard, Project Manager, DATA, 16 Wellesbourne House, Walton Road, Wellesbourne, Warwickshire, CV35 9JB

Appendix B

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ECT Teacher Training Programme – Action Plan

This document is a key document in the ECT programme. At the end of the training programme the teacher, in agreement with the schools senior management, is expected to draw up a school action plan for teaching of electronics in the school. This document must be signed by the Headteacher/Principal where the training is funded by government funds.

Name of School/College DfES No

Name of Heateacher/Principal (Print)

Signed Date / /

Name of accredited teacher (Print)
has been trained by an ECT Accredited Trainer, to an agreed set of competences.

1. Do you currently teach electronics (ECT) in key stage 3 Yes/No
2. If No, when do you plan to introduce work into the scheme of work Academic year /
3. Do you currently teach electronics (ECT) in key stage 4 Yes/No
4. If No, when do you plan to introduce work into the scheme of work Academic year /
5. Explain, with target dates, your proposed changes to the key stage 3 curriculum to ensure electronics (ECT) has a sound foundation:

6. Explain, with target dates, your proposed changes to the key stage 4 curriculum to ensure electronics (ECT) is relevant for young people, increases motivation and raises standards of achievement:

7. Define your future resource and/or accommodation needs with expected dates for implementation:

8. Define your future training needs, and that of colleagues with dates for implementation:

9. Other areas for action planning: