



Industrial Doctorate Centre in Systems

*The University of Bristol/University of Bath
Engineering Doctorate (EngD)*

Programme in Systems

HANDBOOK

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1 WELCOME AND INTRODUCTION

We would like to extend a very warm welcome to all of you as you commence your studies on the EngD programme in Systems. We are looking forward to working and learning with you over the next four years.

We hope that most of your questions will be answered somewhere in this handbook or in the various guidelines available at the partner universities. If you are not able to find the answer to your query please do not hesitate to contact the IDC in Systems Coordinator, who will be able to point you in the right direction.

The purpose of this handbook is to provide a reference source for participants in the EngD in Systems programme, namely Research Engineers (REs)¹, supervisors and taught unit directors. It has been designed to offer information normally required for the duration of the EngD programme from registration to graduation².

Much of the information enclosed within focuses on programme specific information and practical issues; for a comprehensive overview of the Bristol and Bath policies and practices, this handbook *must* be read in conjunction with the relevant University's regulations.

It is important to note that REs are subject to the regulations of the University at which they are registered; hard copies of the appropriate regulations will be issued at registration. Alternatively, information about the Universities' regulations can be found at either

http://www.bris.ac.uk/postgraduates/#Rules_and_regulations or

<http://www.bath.ac.uk/regulations/>

REs registered with **Bristol** will receive a copy of the ***Regulations and Code of Practice for Research Degree Programmes (Bristol Code of Practice)***. REs should familiarise themselves with its contents. As well as providing wider details of the University's research environment, it includes information concerning RE entitlements and responsibilities, the supervisory process and assessment arrangements. Similarly REs registered with **Bath** will wish to acquaint themselves with the ***Code of Practice for Research Students (Bath Code of Practice)***. This handbook contains programme advice and supplements the guidance provided in the Codes of Practice and in collaboration agreements between individual REs' Collaborating Companying companies and the Universities.³

¹ Postgraduate research students on the EngD programme are called Research Engineers.

² The information contained in this handbook is correct at the time of publication. Any revisions will be made in hard copy on an annual basis; for the most up to date edition please refer to the Centre's website at: <http://www.bristol.ac.uk/eng-systems-centre/current/>

³ EPSRC EngD Good Practice Guidelines are included in the collaboration agreement.

2 CONTACT DETAILS

For general enquiries please contact the Industrial Doctorate Centre in Systems
<http://www.bristol.ac.uk/eng-systems-centre/>

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3 OVERVIEW

3.1 The Industrial Doctorate Centre in Systems

Background

The Industrial Doctorate Centre (IDC) in Systems is a partnership between the Universities of Bristol and Bath and is supported by the Engineering and Physical Sciences Research Council (EPSRC).

The Centre builds upon the Universities' world-class portfolios in Systems and Management education to provide a unique approach to engineered systems and their management. It offers an innovative environment and culture, underpinned by renowned excellence in industry-collaborative research, world-class expertise and resources and an holistic, multidisciplinary approach which gives equal emphasis to 'soft' and 'hard' systems.

Objectives

The IDC in Systems offers a four-year full time EngD programme in Systems, which combines doctoral level research and taught Masters' level courses. This postgraduate programme is intended for the UK's most able who have the potential to be tomorrow's leaders in Industry. The EngD is an alternative to the traditional PhD, being better suited to the needs of Industry and providing a more vocationally oriented doctorate in engineering.

REs on the EngD programme are based primarily in industry; spending the majority of their time (approximately 75%) working in a company on innovative research projects in collaboration with the IDC.

In principle, the Systems EngD can be taken as an eight years part time programme; however the RE and the Collaborating Company must be willing and able to commit to the programme for this duration. Furthermore, the RE must spend a significant proportion of their time (about 37.5%, i.e. equivalent to 75% for the full time programme) working on the Research Project or portfolio of projects for the Collaborating Company, normally based in the company. Individuals wishing to pursue postgraduate research to doctoral level mainly in their own time may find a part time PhD programme a more suitable alternative. Other alternatives include part time MSc programmes, which include taught units as well as a research project.

The Systems Centre

The Systems Centre hosts the IDC and offers both a physical location and Internet facilities, including e-learning and video conferencing. The Systems Centre is located in the Merchant Venturers Building at Bristol University (**Annex A1 refers**) and provides an arena for networking and interacting with the wider Systems community, as well as teaching and hot-desking facilities. The Systems Centre facilitates a programme of Systems seminars throughout the academic year and Systems EngD conferences for all REs and their supervisors.

3.2 The EngD in Systems

The Systems EngD is a four-year full-time programme, comprising a doctoral level Research Project and a taught component. REs will usually start on the programme at the beginning of the academic year.

The RE is supported by a company and is based primarily with that company, working on an industry relevant Research Project. The RE can be either an existing employee of the company (“Industry Employed”), or a non-employee on an EPSRC stipend, recruited via the Centre (“Industry Sponsored”). The company collaborates with the Centre on the Research Project and pays the Centre an annual contribution towards its running costs which provide for all activities needed to enhance the experience of being a RE with the Centre. The RE is supervised by an Industrial Supervisor from the Collaborating Company, a principal Academic Supervisor (an academic expert on the project topic) and a secondary Academic Supervisor (a Systems specialist) from either partner university. The company normally identifies the research topic and agrees the project with the IDC, the RE and the principal Academic supervisor.

The taught component (at Masters’ level) includes mandatory units on Systems, Mathematics for Systems and Business Management (further details are enclosed in **Annex B**). The RE can also select units relevant to their research needs from a wide range of specialist options. It is expected that the RE will normally complete the taught units in the first two years of the programme. However, the Centre aims to be as flexible as possible to meet the needs of both industry and the RE and will allow taught units to be taken in the third year.

During the EngD programme, the RE will be mentored, where appropriate, to ensure progression towards CEng status and to develop transferable and personal skills. In general, all time spent on the EngD programme is fully recognised by the Engineering Institutions as counting towards CEng status.

On successful completion of the EngD programme, the RE will receive the award of “EngD in Systems”. The RE will also have:

- Produced a doctoral level dissertation on his/her research, in which Systems Thinking will have been applied in an engineering context. .
- A Masters level understanding of generic Systems and subjects relevant to their research.
- A Masters level education and training in Management and Enterprise skills.
- A high level of competence in transferable skills, e.g. teamwork, leadership, communication, and negotiation skills.
- A network of contacts across the Systems & Systems Engineering community.

It should be emphasized that the intellectual challenge of an EngD is no different to a PhD whilst the outputs expected are in fact greater. As a consequence of the additional skills and competencies to be mastered, and the applied nature of the research undertaken, the EngD is a broader learning experience and qualification. The final assessment, however, and the basis on which the EngD degree is ultimately awarded, is by dissertation and oral examination (viva voce) in exactly the same way as for a PhD.

4 PROGRAMME DETAILS

4.1 Overview

REs carry out their research in close collaboration with an industrial partner and with the University at which they are registered; the taught component of the programme is co-ordinated by the IDC and delivered jointly by the two Universities. The taught programme features four distinct streams

- i) Systems Engineering, covering generic system engineering material;
- ii) Research Methods, covering generic and systems specific research methodology
- iii) Management and Enterprise, covering strategic business and planning material;
- iv) Specialist, covering material specific to the RE's interests.

For reference, the full Bristol Programme Specification is available from the Education Support Unit website:
<https://www.bris.ac.uk/esu/unitprogcat/RouteStructure.jsa?orgCode=CIVE&routeLevelCode=ALL&routeCode=4ENGF001R>

A copy of the Bath Programme Specification can be obtained from the School of Management website:
http://www.bath.ac.uk/management/courses/specifications/pdf/EngD_specs_2009.pdf

4.2 The Research Project

The Research Project is undertaken as a partnership between the Collaborating Company and the Systems Centre. It can be a single project, or a portfolio of projects, firmly based on a real industrial problem with significant challenging and innovative engineering content. The company will normally identify the research topic and will agree the project with the RE, the principal Academic Supervisor and the Systems Centre.

The RE spends the majority of their time (approximately 75%) with the Collaborating Company working on the Research Project and will normally start the Research Project within six months of joining the EngD programme.

4.3 Supervision

The RE is supervised by an Industrial Supervisor (from the Collaborating Company), a principal Academic Supervisor and a secondary academic, or Systems Supervisor from either of the partner universities.

The supervisors oversee the development of the RE and provide advice and support for the Research Project. Together with the RE, they identify the knowledge and skills that the RE should develop and they advise on appropriate units, ensuring that the optional element of the taught programme and professional development is tailored to the RE's needs.

Industrial Supervisor

The Industrial Supervisor will provide the main point of contact with the Collaborating Company and will normally be the line manager directing the Research Project. The Industrial Supervisor will help progress the project within the company, ensuring the project remains pertinent to the company's needs and that the RE has the opportunity to apply the knowledge gained from the taught EngD units.

The Industrial Supervisor will have experience of professional and career development and have technical or managerial knowledge of the industrial problem to be addressed by the RE.

Principal Academic Supervisor

The principal Academic Supervisor will be an expert in the field of the Research Project and will ensure that the academic content and standard of the project work meet the requirements of the doctorate degree. The principal Academic Supervisor will also ensure that the RE has a wide awareness of the subject area of the research and that there is sufficient depth of understanding and analysis within the RE's project reports and EngD dissertation. The principal Academic Supervisor will provide adequate guidance to support all academic activities of the RE, specific to postgraduate education – conference attendance, publications in peer reviewed journals, presentations of research etc.

Secondary Academic Supervisor

The secondary Academic Supervisor will be a Systems specialist. The secondary Supervisor will review all research proposal documents, progress reports and the EngD dissertation to ensure that Systems techniques are being applied to the Research Project.

An analysis of supervisory roles is given in **Annex E**.

4.4 Taught Masters Level Units

REs are advised to complete the taught component in the first two years of the programme to enable them to apply the knowledge and insights gained to their research work. The taught component consists of eight core (i.e. mandatory) units and two elective units. The programme specification is shown in **Annex C**.

Core Units⁴

All core units are delivered as short courses of up to five days. Normally, four core units and one elective will be taken in each of the first two years. However, to provide flexibility, the RE may take more units in any year and move units into year 3 if necessary. Details of core units are given in **Annex B**.

It is recommended that the core units are taken in the order shown below:

1. Research Methods *I*
2. Introduction to Systems
3. Mathematics for Systems

⁴ Please note that the content of core units may change to suit the requirements of industry, in response to feedback from REs and to reflect developments in the fields of the units.

4. Commercialisation of New Technology
5. Research Methods *II*
6. Advanced Systems
7. Integrating Engineering and Management Systems
8. Technology Strategy and Organisation

A “roadmap” of the taught units is shown in **Annex D**

Elective Units

One elective unit should be taken in the first year and another in the second year, preferably with both being at Masters level. The elective units can be taken at either Bristol or Bath universities or at other universities and establishments that have education agreements with Bristol or Bath University. The choice of electives should be discussed and agreed with the RE’s Supervisors and the Programme Director.

In addition to the two electives required for fulfilment of the taught part of the programme, REs may take a maximum of 2 additional elective units subject to the agreement of their Supervisors and the Programme Director.

The RE is responsible for registering for their elective units with the department/school/establishment delivering that unit and for establishing unit timetables. REs should contact the Programme Administrator at their university of registration for further advice.

Credit arrangements

REs will be awarded an EngD by the University at which they are registered on successful completion of the taught and research elements. As explained above, REs may elect to take units provided by other universities or establishments as part of their programme. Such units will be counted as accredited learning; the number of credits that can be accrued in this way will be determined by the University of registration.

When choosing their elective units REs should be aware of the different credit systems. For example, 10 Bristol credits (CATS) equates to 5/6 Bath credits (ECTS) under normal circumstances.

4.5 Attending Units

REs are encouraged to attend all lectures, workshops, seminars and classes delivered as part of the taught programme. This provides REs with the opportunity to network with Systems Engineers from other disciplines and companies and to discuss their research with their academic supervisors.

4.6 Assessment

Mandatory taught units

Taught units will be assessed using a variety of methods including coursework assignments, examination, reflective learning logs and peer review as well as the final dissertation. Specific details can be found in **Annex B** and in the relevant Programme Specification. The RE should be aware that the Universities operate different marking systems. The pass mark for the University of Bristol units is 50%

and for the University of Bath units it is 40%.

The RE is responsible for establishing the assessment method for all core and elective units and times of all unit examinations, where appropriate. The RE is responsible for bringing any clashes in examination times to the attention of the IDC Coordinator and Programme Director at the University at which they are registered so that any issues can be resolved.

Submission of assignments

All University of Bristol coursework assignments will have a specified date for submission which will be advised during the unit and subsequently published on Blackboard for reference. The assignment must be submitted to Blackboard by the stipulated date/time. By submitting the assignment you are accepting the Plagiarism Declaration and confirming that the work is original and does not contain any plagiarised material.

Each assignment report should be typed in 10 to 12 point font, guidelines for the format and presentation of assignments and reports can be found on Blackboard.

- Please include a cover sheet. A template for this is available on Blackboard and includes the Plagiarism Declaration⁵
- Module title and Code
- Name of candidate and candidate student number
- Date of submission
- Word count (excluding appendices)

In addition to the hard copy of your assignment, candidates should also submit an electronic version in the requested format to the relevant drop folder on Blackboard or to the Systems Centre directly giving the electronic file a name which includes your surname, student number and subject, for example;

Smith01725486its.doc	Introduction to Systems
Smith01725486mfs.doc	Mathematics for Systems
Smith01725486rm.doc	Research Methods

All coursework assignments will normally have a specified word limit. The word limit will refer to the main body of the text and so will not include appendices or bibliographies unless specifically stated. You may exceed this word limit only by a maximum of 20%.

Coursework assignment results will normally be returned to the REs within 6 weeks of the submission date. It must be noted that these results remain provisional until confirmed by the Engineering faculty Examination Board.

⁵ The routine use of word processing and websites means that dishonest students have much more opportunity to plagiarise the work of others during assignments. The Higher Education sector has become very sensitive about dishonesty so, regrettably, there is a formal requirement to point out that the System Centre partner universities all operate a 'zero tolerance' policy with respect to academic dishonesty. This means that it is particularly important in assignment reports to acknowledge the sources of all work which is not your own, including data, results and analysis. The disclaimer on the front cover of each report must be included and signed.

The University of Bath may have different regulations and you are therefore advised to check their particular policies on any of the above when undertaking their modules.

Late Submission

The Unit Director may grant an extension to a submission date should there be valid circumstances affecting your ability to meet the deadline.

Note: Extension requests should be made in writing to the Unit Director and copied to the IDC Coordinator detailing the reasons for the extension along with the submission date. These reasons should be endorsed by both supervisors. It is also expected that this request will include any documentary evidence required to support the case made. For example, in the case of illness preventing timely completion of an assignment, it is expected that a request for an extension will be accompanied by a doctor's certificate.

All requests must be made **at least five days** before the deadline. Submission of an extension request does not guarantee agreement to an extension.

If no extension has been granted and a piece of work is submitted after the submission date it will be assessed at a maximum of 50%. Any coursework (for which there are no mitigating circumstances or an agreed extension) submitted later than five days after the submission date will normally receive a mark of zero.

Similarly, the University of Bath will only grant extensions to assessments in exceptional circumstances. It is the responsibility of the RE to liaise with the Unit Director in advance of the deadline date. Requests must be submitted on form QA16 <http://www.bath.ac.uk/mech-eng/internal.bho/extension.pdf> and forwarded to the Bath Programme Administrator providing full details of the circumstances and where possible providing substantiating documentation to support the request.

Taught unit results

The EngD Examination Board, which meets annually, is comprised of members from both Universities and the external examiner. The Board will consider REs under the regulations of the University at which they are registered. The Board will make recommendations to the appropriate committee of the faculty in which the degree is awarded following the regulations of the awarding University.

Compensation of Marks

REs will be allowed one resit/re-assessment per unit **up to a maximum of 50% of their total taught credit points**. Compensation, **up to a maximum of 20 credit points** will be applied after a resit has been taken. However, compensation will only be applied to a resit mark of at least 40% for Level M units and 35% for level H units. Students achieving a resit mark of less than 40% for Level M and 35% for Level H units will have failed the unit. In addition, students must achieve an overall mark of 50% for the taught component.

NB. The University of Bath may have different regulations and you are therefore advised to check their particular policies on any of the above when undertaking their modules.

4.7 Progression

The EngD is intended to be a wider learning experience and qualification than the traditional PhD due both to the additional skills and competencies to be mastered and the applied nature of the research undertaken. The number of taught modules is comparable with an MSc but the overall load is greater and the level of intellectual challenge deliberately higher. EngD students must also recognize that they have a responsibility to their Collaborating Company.

To ensure achievement of the ongoing research objectives, REs are required to participate in regular formal progress monitoring. Progression and continued payment of both the EPSRC core stipend and any top-up from the Collaborating Company, is subject to REs achieving the required standard at each stage in their studies.

The progression “check points” are:

- **6th months** - REs and all supervisors are required initially to hold a formal meeting after the first six months to review the RE's progress and to discuss the Research Project and submit the 6 month review form to the IDC Coordinator within a month of the review meeting.
- **End of the 1st Year** - On the first anniversary of registration the RE is required to prepare a progress report for review and to give oral presentations on their research. REs must take responsibility for arranging a review meeting and will be expected to provide notes of this meeting to the supervisors. The 1st Year Annual Review form then needs to be submitted to the IDC Coordinator.
- **End of the 2nd Year** - At the end of the second anniversary of registration, REs are required to submit an extended plan for their EngD project approved by their supervisors. In addition, the RE will, with the support and endorsement of the Industrial Supervisor, make a statement concerning the overall **impact** of the Project on the Company's business. These will be presented by each RE during a one day Conference as a part of the Induction week at the start of the academic year to the conference delegates and to a panel of Academics who will provide feedback. The RE should meet with their supervisors after the Conference to discuss this feedback, and submit the 2nd Year Annual Review form to the IDC Coordinator.
- **End of the 3rd Year** - At the end of the third anniversary of registration, to ensure sustainable academic/research progress, all REs will be reviewed by an independent academic reviewer. This review will be organised by the Centre. Preparation guide notes for the review are available on Blackboard and the 3rd Year Annual Review form needs to be completed with the supervisors taking into account the feedback from the Independent Reviewer, and submitted to the IDC Coordinator.
- All REs will be expected to participate in the **Annual EngD in Systems Research Conference**, where final year REs will present their research in a form of an oral contribution and a research paper (3 pages of A4). All other REs will present a poster at the Conference with up to date research goals and results and an Abstract (1 page, A4). These Papers and Abstracts will be published in the Conference programme and proceedings. Oral presentations will be evaluated by Conference delegates and a panel of Academics and Industry representatives. Their feedback will be supplemented by a video recording of the presentation to provide further learning.

If at any stage of the programme, an RE's progress is recognised to be unsatisfactory and there is recorded concern about the possible achievement of a doctoral level degree, the "at risk" procedure at the University where the RE is registered will be invoked. Details of this procedure can be found in the CoP of the relevant university.

Exit Awards

Subject to having sufficient credits exit awards are available for all Bristol University registered REs, if for any reason they are unable to complete the full programme. Bath University is planning to introduce exit awards in the 2011/12 academic year.

4.8 Publications

During their time on the EngD programme REs are encouraged to disseminate their research by presenting at conferences and producing refereed publications. The existence of refereed publications can be an important factor in the final examination of any doctoral qualification, because it provides evidence to suggest that an original contribution to knowledge has been made.

4.9 The Portfolio

Throughout the programme the RE must maintain a portfolio comprising *inter alia* copies of assignments for the taught component, the progress reports, scientific papers, articles and publications written by the RE, reports on research and development project(s) completed during the period of registration and any other documents that support the RE's case for becoming a Doctor of Engineering. These could include, for example, evidence of project planning and financial management or reports on trials and transfer of new technology within the industrial environment.

Research documents in the portfolio should demonstrate the context of the research; explain clearly the methods used and present results with critical discussion.

The RE is responsible for the management of their portfolio, but can expect suitable encouragement and support from their supervisors. Portfolios are held by the Centre.

4.10 The EngD Dissertation

At the end of the research programme, the RE is required to submit a dissertation on their Research Project. The regulations applying to EngD dissertations at each University will be followed, with the additional requirement that the dissertation can be submitted only after the taught component of the EngD has been completed successfully.

The dissertation is the culmination of any doctoral degree and the basis upon which the final award is made. It should be a work of scholarship in its own right and make a significant contribution to the chosen field of research. The dissertation should reflect a state-of-the-art understanding of the field of research and its application in an industrial or commercial context. REs are expected to demonstrate originality of

thought, innovation, creativity and a contribution to knowledge. In this respect the EngD is no different to a traditional PhD although the scope will normally be broader to reflect the diversity of research (both technical and non-technical) typically involved. The EPSRC Engineering Doctorate Programme Best Practice document states “the quality of research must be at least equal to that expected for other doctoral level training and the examination process must reflect and ensure this”.

In many instances, particularly where EngD research is focused on a single technical problem, the resulting dissertation may be very similar to a PhD in engineering or applied science. In other cases, the research may be strongly interdisciplinary and involve a number of related sub-projects encompassing, perhaps, economics, management or the environmental or social impact of technology. In these cases the content of the dissertation will be somewhat different with no single topic researched to the same depth as might be expected in a PhD. However, whilst the content of the dissertation may be different the quality of intellectual argument presented should be the same. In all cases, guidance should be sought from supervisors as to the most appropriate structure.

Whatever its content, it must be emphasized that a dissertation is more than simply a report of work done or a compilation of discrete reports drawn from the RE’s portfolio). The work compiled in the RE’s portfolio over the duration of the EngD provides the material on which the dissertation is based. Whilst a number of discrete (although related) sub-projects may be undertaken in the course of placement periods with the Collaborating Company, the final dissertation must read as a coherent work of scholarship.

The dissertation and the candidate’s performance at a viva voce exam will be evaluated by at least one external examiner and an internal examiner according to University regulations. The academic supervisor and industry mentor may be invited to attend the viva by the candidate but cannot take part in the examination process.

Guidance on the layout, format and assessment of the dissertation can be found in the Bristol and Bath Code of Practice booklets.

A “roadmap” showing the journey to the dissertation via the reflective log learning, progression stages and the portfolio is shown in **Annex D**.

4.11 Professional Development

During the EngD programme, the RE will be mentored to ensure progression towards CEng status, where appropriate and to develop transferable and personal skills. REs are advised to attend courses on, for example, presentation skills, communication, writing research proposals, technical papers, an EngD dissertation, etc. The Collaborating Company, the Universities and the IDC provide transferable skills training programmes, with which all REs are encouraged to familiarise themselves and attend as necessary to meet the RE’s individual need. More details are available at the Centre and can be found on the following websites

Bristol University: <http://www.bris.ac.uk/studentskills/>

Bath University: <http://www.bath.ac.uk/research/pgskills/>

5 THE SUPERVISORY RELATIONSHIP

The supervisory relationship is one of the most crucial ingredients underpinning successful research studies. The relationship is two-sided, with obligations on both supervisors as well as the RE. Like any relationship, it has to be worked at and nurtured. It is therefore important to establish clear and explicit mutual expectations in order to minimise the risks and possible difficulties of personality clashes.

The EPSRC provide advice on good supervisory practice on their website as an annex to the Studentship Handbook (<http://www.epsrc.ac.uk/>). Although orientated to the PhD most of the messages are valid for EngD.

There is also guidance available from each of the Universities in their Code of Practice for research students and their supervisors. If further guidance or advice is required, the Programme Director at the relevant University should be contacted in the first instance.

Regular contact is essential, especially at the start of the project. In particular the Systems Supervisor should meet with the RE and the other supervisors at the start of the project to ensure that Systems Thinking is being applied from the outset.

During the first year of registration the Academic Supervisor should take responsibility to ensure that regular meetings take place. The RE should assume this responsibility as soon as possible and certainly from the second year onward. It is suggested that the programme of meetings is drawn up well in advance and that supervisors/REs avoid rescheduling.

Normally the industrial and academic supervisors should meet together with the RE every 2 to 3 months. Meetings should be organised by the RE who should provide an agenda and chair the meeting. One of the results of these meetings should be agreed action plans to include objectives (academic/industrial/personal) and deliverables which will demonstrate that the objectives are being met.

6 Guide Notes

6.1 Annual EngD Systems Research Conference Guide Note

Aims

The Industrial Doctorate Centre in Systems holds an Annual Conference, which alternates in venue between Bristol and Bath Universities and is usually held over two days. The main aim is to provide an opportunity for REs to present and defend their work to a diverse and knowledgeable audience.

This involves all REs, in their final year, presenting a conference paper for the proceedings. All other REs are asked to prepare a poster presentation for the Conference.

The Conference provides an excellent introduction to the Programme for new REs and their supervisors. It provides an invaluable opportunity for networking. It also allows REs to hear about the research their peers are involved with, which should allow them to identify people who may be able to provide additional support during their research.

Publication Policy

Normally, all papers, posters and presentation slides submitted to the Annual Conference are published in a Yearbook. This has a number of consequences, as follows:

- REs must ensure that their supervisors have approved the content of their papers, posters and presentation slides before they are submitted;
- REs must ensure that any difficulties with confidentiality relating to the research they wish to present have been discussed and resolved with their industrial Collaborating Company before submission. In the event that this cannot be resolved satisfactorily and there are problems with submission, please contact the Systems Centre Manager in the first instance.

Content and Format of Submissions

Papers submitted to the proceedings and poster presentations are generally focussed on a particular aspect of the RE's work. This should be chosen to be of interest to the audience and therefore may not necessarily describe the complete research to date. The format and layout of the papers can be found on Blackboard.

Feedback

REs should expect to receive challenging questions following their presentations. It is recommended that the REs discuss this with their supervisors and agree the best means of preparation (e.g. a dry run, etc).

In order to maximise the feedback given to the REs, normally attendees at the Conference will be asked to fill in a feedback form for each presentation and poster. In addition, every delegate will be asked to provide at least one question to be fed back to the RE, to aid reflection on how well they have communicated the main research questions and findings. It is recommended that the RE discusses this feedback with their supervisors, in order to make best use of it in planning their research and evaluating their communication skills.

6.2 Attendance at Conferences

REs are encouraged to attend and present their research at least one external conference during the 4 years of the Programme. For presentations at conferences of international stature, where the papers are refereed and where the RE is the principal author, the Centre will provide financial assistance. REs are also encouraged to seek sponsorship from their Collaborating Company, their University and from professional bodies and associations. To apply for assistance, REs should present their case in writing (supported by their supervisors) to the Centre. This should be submitted for approval well in advance of the conference dates. ***A guide note on How to apply for Conference funding can be found on the Blackboard.***

6.3 Peer Reviewed Publications, Authorship and Conferences

Authorship of Publications

It is important to the EPSRC, as well as being a part of academic ethics, that the funding/sponsorship support for the research is acknowledged. This should begin with authorship of publications; normally the authors should be the RE and their supervisors plus other researchers contributing to the publication. Although it is feasible that a paper on a limited area of work could be authored by the RE alone, or with only one supervisor, the exclusion of one or more of the supervisors could indicate that the RE/Supervisor team is not working well. Proposed publications on the research work by any party should be discussed as an agenda item at progress meetings and disputes resolved before publication.

Appropriate Recognition for funding of the EngD Programme

All REs (sponsored and employed) should show their joint affiliation (i.e. Collaborating Company or Employer Company/IDC in Systems at the University of Bristol or Bath) on published papers. There should be a suitable endnote explaining that the RE “is registered on an Engineering Doctorate Programme at the Industrial Doctorate Centre in Systems, at the University of Bristol or the University of Bath”.

An Example of Acknowledgement (a small paragraph, placed before References):
“This work was supported by the Systems Centre and the EPSRC funded Industrial Doctorate Centre in Systems (Grant EP/G037353/1) and ** (Collaborating Company name).”***

This must be quoted in any publication, as well as on presentation slides. Each RE must also make sure that they have a reference to their Collaborating Company on their slides.

Generating Publicity for the EngD Qualification

All REs benefit from the wider dissemination of knowledge about the EngD Programme. For example, if more employers are aware of the qualification, this will make the task of explaining the skills acquired on the Programme far easier in looking for a suitable post after graduation. To this end, it would be an advantage to include some information about the Programme in papers/media references where possible. A presentation slide with information about the IDC and EngD in Systems programme is available on Blackboard, to be included into the RE’s external presentations whenever appropriate.

REs should make use of their Collaborating Company's PR department if available. The correct name of the Programme is "The University of Bristol/University of Bath Engineering Doctorate (EngD) Programme in Systems".

Please report and copy all publications (including press cuttings) to the Systems Centre office at Bristol.

6.4 EngD in Systems - Progress Review process

6 months - meeting with supervisors

- Submit report to supervisors
- meet with Industrial and Academic supervisors,
- *Systems supervisor probably not allocated yet*
- Complete "**6th months**" progress review form, submit to Centre
- Centre will follow up any actions

1st year - meeting with supervisors, plus poster at the Annual Research Conference (May)

- Submit report to supervisors
- meet with industrial and academic supervisors
- *Systems supervisor may be allocated, include them in meeting if so*
- *Or Systems supervisor to be allocated following this meeting*
- **Complete 1st Year form**, submit to Centre
- Centre will follow up any actions

2nd year – Present at EngD Systems “end of 2nd Year” Conference (October) plus poster at Annual Research Conference (May)

- Submit report to supervisors, to include **Impact Statement**.
- Give presentation at the October conference during Induction Week
- A panel of academics will provide evaluation and feedback
- Meet with 3 supervisors to review the feedback from the conference; to discuss the report
- Complete **2nd Year form**, submit to Centre
- Centre will follow up any actions

3rd year – Independent Review - plus poster at May Conference **PLUS SUBMIT IMPACT STATEMENT IF NOT DONE SO**

- An independent reviewer will be recommended by the Academic Supervisor
- The reviewer CANNOT be anyone who might later be an examiner at the final viva
- Submit report to supervisors and Independent Reviewer
- Meet reviewer: short presentation plus aural viva (max 1 hour)
- Meet supervisors to review the feedback from the reviewer, plan actions
- Complete form and submit to the Centre
- Centre will follow up any actions

4th year – Present at the Annual Research conference and voluntary practice viva

PLUS REVIEW IMPACT STATEMENT to be included into EngD thesis

- Present at May conference, submit abstract and research paper for the Conference proceedings
- All 4th years REs will be offered the opportunity to have a practise viva after submission

6.5 A Report: End of 2nd and 3rd Years

Prepare a report of no more than ~3,000 - 5,000 words (~ 8-10 A4 pages). The components of this report must include and to be clearly outlined:

- **Introduction** - Give an introduction to your research topic and the report.
- **Summary of the literature review** – Provide an extract of the main concepts/conclusions derived from a critical evaluation and analysis of papers read and concepts encountered (*based upon, but not equal to, a whole literature review for your EngD thesis, which is assumed as already prepared*).
- **Progress to date.** – describe any novel work to date other than reading, e.g. development of theory, implementation of prototype, experimental set up etc., as appropriate to your research. Include reflection on objectives set in the last year's report and provide evidence based comments on progression since your last report.
- **For 2nd Year report - Impact statement** (one A4 page) - with the support and endorsement of the Industrial Supervisor make a statement concerning the overall impact of the Project on the Company's business – i.e. contribution to or development of new processes, products, tools, with equivalent of £*** to the business.
- **Plan** –
 - Describe what directions you intend to take on your further research, with some detail as to how this will be achieved (e.g. 'I will apply theory X to problem Y to come up with a solution; here is an intuitive example of how and why this will work', rather than 'I will solve problem Y').
 - Provide an evaluation of the probability of success for each direction, fall-back work to do if the original directions do not work out;
 - Provide a current version of your EngD thesis outline.
- **Appendices** (no more than a few pages) – Provide brief statements of all EngD related activities undertaken so far, such as academic and personal development courses attended, conferences attended, presentations given, papers submitted/accepted and rejected (together with review comments), etc.

These reports must be submitted to Supervisors and to the IDC at least 1-2 weeks prior to the EngD Systems Conference during the Induction week (every October) – for end of 2nd Year, and prior to the interview with independent reviewer for end of 3rd Year REs.

7 ADMINISTRATIVE DETAILS

7.1 Registration

The RE must register as a postgraduate research student, at either of the Universities of Bristol or Bath depending on where the RE's principal Academic Supervisor is based. REs will retain full access and privileges offered by the Systems Centre regardless of the University at which they are registered.

Registration determines both the final award that the RE will receive and which University's regulations and procedures the RE must comply with during the course of their studies.

Complaints and Appeals

Complaints/appeals at programme level will be dealt with by the University at which the RE is registered according to that University's procedures.

Complaints/appeals at unit level will be dealt with by the University awarding credit for that unit according to that University's procedures.

Laptop Computers

The RE may be required to use a laptop computer whilst attending the core units and we expect the Collaborating Company to provide the RE with a suitable computer. Some units may require the use of particular software packages, e.g. MATLAB.

Library and network arrangements for REs

The RE will have library access and campus network access, at both Universities.

REs registered at Bristol will automatically receive access to the University's network, electronic library resources and borrowing libraries. To access equivalent resources at Bath the RE will have to register as a 'Visiting Research Student'. This must be done in person via the library at Bath.

REs registered at Bath will automatically receive access to the University's library and IT facilities, as above. To access equivalent resources at Bristol the RE must register as an 'Occasional Student'. Registration will be completed by the IDC Coordinator prior to Induction.

7.2 Induction Programme

At the start of the first year of the programme, REs will be expected to attend an "Induction Course" to which Industrial Supervisors may also be invited.

7.3 Financial Arrangements

REs should contact the relevant finance office for information and advice about financial arrangements while they are studying:

The Student Funding Office at Bristol: <http://www.bris.ac.uk/studentfunding/>

The Graduate Office at Bath: <http://www.bath.ac.uk/prospectus/postgrad/finance/>

7.4 RE Entitlements and Responsibilities

REs are full-time students of either Bristol or Bath and will be made aware of their entitlements and responsibilities by the relevant University once they have accepted their place. This information will also form part of the RE's initial meeting with their principal Academic Supervisor. REs should refer to the CoP of the University at which they are registered.

A summary of roles and responsibilities of the RE and other members of the programme is provided at **Annex E**.

Support arrangements

Academic Supervisors are the first port of call for REs' non-academic queries and concerns. However, REs are advised to discuss administrative matters with the Systems Centre staff in the first instance.

Other sources of advice and information at Bristol

The Access Centre for deaf and disabled students:

<http://www.bris.ac.uk/depts/AccessUnit/>

The *Student Help* site which provides advice for all students on all aspects of University life including study, personal and practical problems:

<http://www.bris.ac.uk/studenthelp/>

Other sources of information at Bath:

Student Support Services (<http://www.bath.ac.uk/prospectus/postgrad/support/>).

RE representation

Student representatives at Bristol attend the Faculty Board, various Faculty committees and Senate. REs are eligible to stand for election as student representatives. Please contact your departmental office for details of your student representative.

At Bath, Staff/Student Liaison Committees provide a two-way channel of communication between the University and students about all aspects of the programmes and student experience. Students' academic representatives are elected by students on each programme to represent their views. Please contact your departmental office for further details.

Holiday Entitlement

RE's holiday entitlements are governed by EPSRC regulations which allow up to 8 weeks per year (including Bank Holidays). However, REs need to be sensitive to the culture of the Collaborating Company's organisation when deciding on the length and timing of holidays.

Normally it is expected that REs should take a similar holiday entitlement to "staff" at a similar level in the organisation. It is advised that plenty of notice should be given for longer holidays and these should be agreed and factored into the RE's project management plan.

7.5 Income Tax Status

Stipend payments to REs, issued by the Universities, should not be subject to income tax provided the top up awarded by the Collaborating Company is not

excessive. For this reason, the IDC puts a limit on the level of stipend top up administered through the Centre. Any earnings over and above the stipend payments issued by the Universities will most certainly be subject to income tax and the advice of the Centre is to declare them when required to do so.

7.6 Absence Due to Ill-Health

For absence due to ill health, REs should inform their Collaborating Company and Academic Supervisor. For absences of one week or longer the IDC office should also be informed so that a record may be kept for use by the Board of Examiners. This should be accompanied by the appropriate supporting evidence (e.g. note from the RE's doctor).

7.7 Facilities

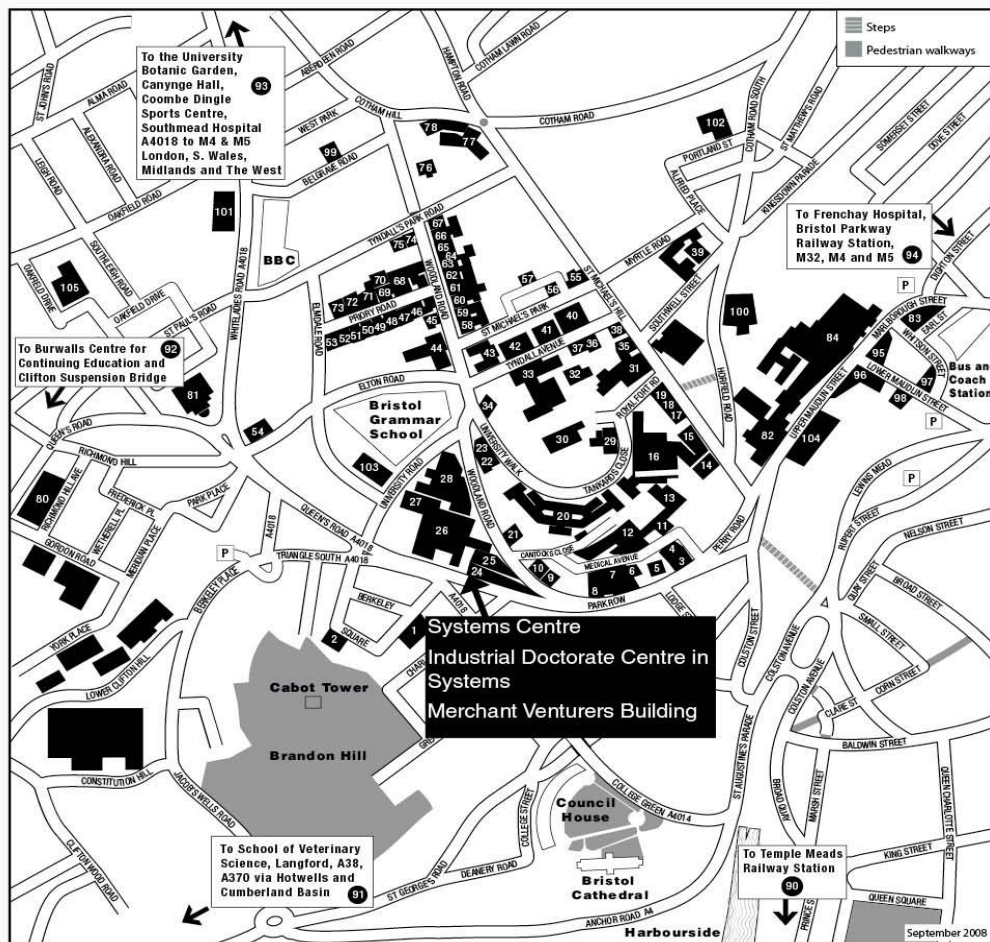
As REs are based with their Collaborating Company it is a requirement of the Programme that an adequate workspace, including personal computer facilities, is provided by the Collaborating Company. The Systems Centre is based in the Merchant Venturers Building (formerly the KES Suite) where a dedicated REs Office is available. Any REs who are visiting the University of Bristol are very welcome to drop in, and to use the flexible accommodation as needed, either for occasional study or social gatherings, to practise presentations, hold informal discussions, debating sessions or for self-run study days.

ANNEXURES

Annex A1 – University of Bristol Precinct Map

For further details and directions, please view the University of Bristol website:

<http://www.bristol.ac.uk/university/maps/>



Annex A2 – University of Bath Precinct Map

For further details and directions, please view the University of Bath website:

<http://www.bath.ac.uk/maps/campusmap.html>



Key

- | | | | |
|---|--|--|--|
| Weston House | | DEPARTMENTS | |
| CENTRAL ADMINISTRATION | | 4E 10E Architecture & Civil Engineering | |
| Vice-Chancellor | | 74S Biology & Biochemistry | |
| Office of Policy and Planning | | 28 BUCS | |
| University Secretary | | 5W Chemical Engineering | |
| Registry | | 1S 3S Chemistry | |
| Recruitment and Admissions | | 1W Computer Science | |
| Graduate Office | | 3E Economics & International Development | |
| International Office | | 1W 1WN Education (Coach Education) | |
| Student Records & Examinations | | 2E 4E Electronic & Electrical Engineering | |
| Undergraduate Admissions | | 1WN European Studies & Modern Languages | |
| Records Management Service and FoIA | | 3W School of Management | |
| Development & Alumni Relations | | 1W Mathematical Sciences | |
| Corporate Communications Services | | 4E 10E Mechanical Engineering (Sports Engineering) | |
| Finance | | 3S Natural Sciences | |
| Human Resources | | 5W 7W Pharmacy & Pharmacology | |
| | | 3W Physics | |
| | | 2E Psychology | |
| | | Eastwood 22-23 School for Health Central House | |
| | | 30 Social & Policy Sciences | |
| | | Eastwood 22-23 Sport & Exercise Science | |
| | | Weston House Student Services | |
| | | Eastwood Offices Learning Support | |
| | | | |
| AMENITIES | | ACCOMMODATION | |
| 1 Library - Security and Enquiries | | Norwood House | |
| 2 Chaplaincy Centre | | Polden Court | |
| 3 Students Union | | Westwood | |
| 4 25m Swimming Pool | | Brendon Court | |
| 5 Founders Sports Hall | | Eastwood | |
| 6 Arts Barn & Arts Lecture Theatre (ALTA) | | Marlborough Court | |
| 7 Sports Training Village/Blues Café | | Salsbury Court | |
| 8 Medical/Dental Centre | | Woodland Court | |
| 9 University Hall | | Osborne House | |
| 10 Level 1 Café, Parade Bar, Claverton Rooms Restaurant | | | |
| 11 Student Accommodation Office | | | |
| 12 Post Office, Banks & Shops | | | |
| 13 Accommodation Services Centre | | | |
| 14 UBSA | | | |
| 15 Central Stores | | | |
| 16 Estates | | | |
| 17 Student Money Centre | | | |
| 18 Imaging Design & Print | | | |
| 19 Applied Biomechanics Suite Sport & Exercise Science (School for Health) | | | |
| 20 Westwood Nursery | | | |
| 21 Careers | | | |
| Norwood House 2.7 | | | |
| ● City Bus Service | | | |
| ▲ Fire Assembly Points | | | |
| P Parking: Pay & Display and Permit Holders | | | |
| PT Parking: Permit Holders only | | | |

Annex B- Core Units

Please note that core unit content may change to suit the requirements of Industry, in response to feedback from REs and to reflect developments in the fields of each of the units.

Research Methods I

Unit Director	Dr Mike Yearworth
Unit Venue	University of Bristol, Systems Centre
Aims	This unit aims to give students in depth knowledge, understanding and skills in generic research methods and research design strategies. This will enable them to successfully design, justify and manage research projects at Doctoral Level in a variety of fields involving combinations of pure, applied and social science traditions. It also forms the basis for EngD Research Engineers addressing systems level research in the Research Methods (2) unit. The unit also aims to introduce students to the principles of programme management. Programme management is relevant when designing and managing a portfolio of research projects aimed at creating major change and benefits in an organisational setting.
Description	<p>This unit will introduce students to the basic principles of research methods and their application in research projects across the pure, applied and social sciences to enable research at Doctoral Level.</p> <p>The unit will cover the basic research paradigms and philosophical positions underlying different traditions in research, review approaches to problem exploration and definition, consider different research design strategies and outline approaches for conducting literature review. Techniques for gathering and rigorously analysing data of both quantitative and qualitative types and reporting of research results in peer reviewed publications will also be covered. Emphasis will be placed on the need to combine quantitative and qualitative approaches when addressing many real problems which bridge traditional research disciplines.</p> <p>This will enable students to successfully design, conduct and supervise various types of research and give them a broad understanding of the purpose and application of research methods. The unit also provides the basic prerequisite knowledge and skills to enable EngD Research Engineers to undertake the Research Methods 2 Unit, which covers research strategy and design in relation to complex systems.</p> <p>For research activities which involve a portfolio of individual projects and are likely to be aimed at creating major change and benefits in an organisational setting, an introduction to the principles of programme management will also be covered.</p>
Teaching	Lectures, case studies, discussion sessions/seminars and workshop on literature searching.
Assessment	An assignment submitted after the unit which addresses a case study on programme management and a research proposal on a topic of the student's choice
Learning outcomes	<p>This unit provides opportunities for students to develop and demonstrate in depth knowledge, understanding and skills in research in the following areas:</p> <ul style="list-style-type: none"> • basic research paradigms and philosophical positions underlying different traditions in research, • problem exploration, investigation and definition • literature review • articulating research questions and hypotheses • research design strategies and combined qualitative/quantitative approaches • justification of research design including considerations of reliability, validity and generalisability of findings • conducting qualitative and quantitative data collection • rigorous analysis of qualitative and quantitative data • presentation and reporting of findings in peer-reviewed publications • application of programme management techniques in the design and execution of research portfolios

Introduction to Systems

Unit Director	Dr Theo Tryfonas
Unit Venue	University of Bristol, Systems Centre
Aims	To provide an introduction to basic systems with a practical bias relevant to the student's industrial background.
Description	This unit is the first taught element with exclusive emphasis on systems in the Systems EngD programme, introducing the basics of traditional "hard" systems with an artefact-based emphasis. However, wider aspects are introduced and the material is highlighted as a starting point rather than a complete coverage of Systems.
Teaching	Lectures (systems fundamentals and invited speaker topics), tutorials (UML) and workshops (LEGO challenge).
Assessment	Formative group work (teaching week) – tackling a given challenge with LEGO NXT. One summative piece of assessed written work (100%). This is in the form of a reflecting learning log summarising key aspects of the learning experience and their relevance to each student's industrial case.
Learning outcomes	On successful completion of the unit, the student will have: an elementary and mostly qualitative knowledge of systems theoretical concepts, modelling techniques and industrial conventions and practice; an awareness of the wider range of systems beyond the scope of the unit material, in part through the formative tasks and the required pre-readings; developed skills in reflection and producing technical documentation; and a familiarisation with leading engineering systems modelling tools and platforms, including UML, IBM Rational Software etc.

Mathematics for Systems

Unit Director	Dr. David Barton
Unit Venue	University of Bristol, Systems Centre
Aims	To acquaint students with modern applied mathematics topics, which build upon and span beyond material traditionally taught to undergraduate engineers. The style of the course will be one of raising broad awareness of the mathematical tools that are available, rather than traditional didactic teaching in narrow topics.
Description	This unit will give a taster to some topics in modern applied mathematics, which we feel every budding systems engineer should know about. The teaching will be delivered in one week, with a different topic on each day, typical titles being: Complex Networks; Information from Data; Optimisation and Linear Programming; Handling Uncertainty; Nonlinear Dynamics.
Teaching	Small group interactive lectures plus breakout into discussion groups and small computer demo classes. Follow-on support by email contact with postgraduate students/postdoctoral researchers.
Assessment	Each of the unit's five topics will have a short worksheet to be completed within two weeks after the teaching. Each of the unit's five topics will also have a suggested list of ideas/applications for future study. Each student should pick two ideas, preferably from different topics and research and scope each out in a short essay.
Learning outcomes	<p>At the end of this course, students will:</p> <ul style="list-style-type: none"> • be comfortable with Matlab interface and basic programming constructs and be able to apply Matlab to basic problems in simulation and data analysis. • be able to identify hallmarks of real-world nonlinear behaviour and to re-count and apply some basic mathematical terminology and results. • be able to phrase optimal design problems in mathematical language and be able to identify which of several broad families they apply to and hence make an informed choice about the solution method. • understand the difference between data and knowledge and be able to list some standard techniques for extracting the latter from the former and be able to implement these techniques in Matlab. • be able to list real-world case studies in which there are emergent phenomena from many simple interacting subsystems and be able to investigate this emergence by using simple simulation techniques. • have an appreciation of the manifold possibilities in the application of modern applied mathematics to real-world problems.

Commercialisation of New Technology

Unit Director	Prof. Andrew Graves/Dr Niall Piercy
Unit Venue	University of Bath, School of Management
Aims	The aim of this unit is to examine how products and services can best be commercialised through an understanding of markets and marketing
Course Content	The ability to rapidly deliver new products or services to the marketplace is increasingly seen as a core competitive advantage for the modern organisation. This module serves as a introduction to the processes by which organisations in the public and private sector bring new products and services to the marketplace. Students will consider the strategic process to the marketplace: This will include customer analysis, conducting a marketing audit, integrating marketing with the broader business, mapping out the strategic pathway to the market/marketing planning process, implementing and monitoring marketing strategy.
Teaching	This unit will employ a wide range of case studies, class exercises and games to enforce the students' understanding of key concepts.
Assessment	Examination: 100%
Learning outcomes	At the end of the course students will be able to: <ul style="list-style-type: none"> • Appreciate the way in which products and services are taken to the marketplace. • Understand contemporary marketing tools and techniques for market analysis. • Integrate market-defined needs with organisational process to usefully commercialise new products and services

Research Methods II

Unit Director	Dr Mike Yearworth
Unit Venue	University of Bristol, Systems Centre
Aims	<p>This unit aims to:</p> <ol style="list-style-type: none"> 1) Develop further understanding of different system archetypes, methods of categorising these and the various purposes and aims of systems research which could be relevant in such cases 2) Advance knowledge in systems theory and develop a deeper understanding of different philosophical perspectives and assumptions which may be brought to bear in planning research in or on systems, including holistic and reductionist viewpoints 3) Build upon Research Methods (1) and other taught units to further develop understanding of systems modelling, systems level research strategies, methods and techniques for data collection and analysis which bridge traditional research disciplines and can be applied in complex, hierarchical systems involving hard and soft aspects 4) Prepare REs for planning and conducting an independent Doctoral Level systems research project relevant to their organisations by providing an opportunity to develop a preliminary proposal and obtain formative feedback on this from peers, supervisors and other experts 5) Build on Research Methods (1), to generate an understanding of strategies and methods required to deliver a dissertation by portfolio. This will include: abstraction of dissertation from a set of industrial research projects, visioning the dissertation, preparation of the portfolio, integration of different research methods/paradigms and addressing examiners expectations.
Description	<p>This unit will build on Research Methods (1), giving Research Engineers (RE) a deeper understanding of the purposes of research, research design strategies and application of research methods when conducting research on complex systems of various kinds. On this basis, students will be required to develop a formal systems research proposal for their EngD topic. A paper on this will be drafted and presented to peers and supervisors during the unit in order to obtain formative feedback. This will be expanded into a formal research proposal for later assessment.</p>
Teaching	Lectures, case studies, discussion sessions/seminars and workshop on literature searching.
Assessment	An assignment submitted after the unit which addresses a case study on programme management and a research proposal on a topic of the student's choice
Learning outcomes	<p>After the completion of the unit the RE should be able to:</p> <ol style="list-style-type: none"> 1) Understand the different system archetypes which can exist, ways of categorising these and the characteristics of their own system which they plan to research 2) Understand the range of potential objectives and purposes of carrying out research at systems level and define the essential purpose(s) in their case 3) Identify and discuss different philosophical perspectives and assumptions in systems research; identify, reflect on and justify the particular perspective(s) chosen in their work 4) Undertake appropriate systems modelling for their project; identify, describe and justify applicable research approaches, methodologies, methods and techniques they plan to use 5) Understand the meanings of and the relationships between theory and methodology in systems research and be able to address the concepts of reliability, validity and generalisability of research findings in their planned research; 6) Develop and present a draft systems research proposal of relevance to their organisation utilising the above outcomes and any earlier agreements; based on feedback received, expand this into a formal proposal for assessment and to guide their future EngD systems research

Advanced Systems

Unit Director	Dr Mike Yearworth
Unit Venue	University of Bristol, Systems Centre
Aims	<p>1 To develop a “softer” systems perspective of complex engineering problems.</p> <p>2 To prepare engineers to lead change in industry</p>
Description	This unit is at the heart of the Systems EngD. It develops understanding and awareness and deals with specific generic tools in the softer aspects of systems. It introduces the philosophical underpinnings of Systems and Systems Thinking, deals with the personal skills required to provide leadership and manage change and introduces Problem Structuring Methods and Systems Dynamics.
Teaching	Interactive lectures (engineers relate their own experience in dealing with issues that arise), seminars from outside experts and workshops and team exercises.
Assessment	<p>An essay on a selected book from the reading list</p> <p>A negotiated project in the areas of Problem Structuring Methods, Systems Dynamics or Visualisation.</p>
Learning outcomes	<p>On successful completion of the unit the student will be able to:</p> <ul style="list-style-type: none"> • describe and apply a systems approach to technical and managerial thinking • identify modelling issues including world views • describe and map out organisational processes using problem structuring methods and visualisation • build relevant causal loop diagrams and systems dynamics models • describe and use tools for the measurement of the performance of processes • begin to lead change • identify the ethical dilemmas of international business • use the ideas of principled negotiation

Technology, Strategy and Organisation

Unit Director	Prof. Andrew Graves/Prof. Michael Lewis
Unit Venue	University of Bath, School of Management
Aims	The unit aims to examine the nature and role of technology strategy in creating value for the innovative organisation
Course Content	<p>Although some organisations are obviously 'high-tech' or 'technology intensive', it is increasingly difficult to find any organisation whose core mission is not dependent upon the effective use of some form of technology. In other words, far from being an 'add on' component, technology needs to be addressed as an integral part of strategic and organisational processes.</p> <p>After briefly covering the fundamentals of strategic management, the course introduces a range of perspectives on technology strategy. The pragmatic emphasis throughout is on applying conceptual models to help students explore the interactions between broad patterns of technological and market change, specific competitive forces and internal firm resources.</p> <p>This unit will be based upon three broadly thematic sections. The first will cover the nature and content of technology strategy. It will make explicit connections to broader business strategy concepts and delineate the key dimensions of a technology strategy. This section will also cover patterns of technological evolution (S-curves) and historical/socio-economic perspectives.</p> <p>The second section will cover the organisational and industrial context for technology strategy. Industrial themes will include appropriability, IPR issues, the emergence of standards, etc. Organisational themes will include the impact of structural, cultural and political factors on adaptation, selection, development and deployment of technological capabilities.</p> <p>The final section will address the enactment of technology strategy. It will use a range of case studies to understand the practical aspects of translating policy into appropriate resource commitments and managing corresponding change processes.</p>
Teaching	This unit will employ a wide range of case studies, class exercises and games to enforce the students' understanding of key technology strategy and organisation concepts.
Assessment	Coursework (In class presentation): 20% Examination (2 hours) 80%
Learning outcomes	<p>At the end of the course students will understand:</p> <ul style="list-style-type: none"> • How an effective technology strategy creates and captures value. • The co-evolution of technologies and industries - and how competitive forces are modified over the life-cycle. • How technology can destroy or enhance organisational capabilities. • The role of entrepreneurial action in technology strategy: from start-up firms to multi-national organisations. • The role of standards and their impact on competition. • How political and cultural forces profoundly influence the creation and execution of technological options. • How a range of practical tools (scenario planning, real options, etc.) can be used to develop practical technology strategies.

Integrating Engineering and Management Systems

Unit Director	Prof Patrick Godfrey
Unit Venue	University of Bristol, Systems Centre
Aims	On successful completion of the module, the student will have demonstrated that they can plan and deliver a systems-thinking approach to solving a practical systems problem and have used the process to add to the body of knowledge in the subject. They will also learn from peer review of their colleagues' approaches and results.
Description	This unit is the final mandatory module in support of the REs EngD Research Project. It will take the form of a "master class in two sessions" to address key challenges in systems that have emerged from the first 18 months of their EngD research work. Each RE will identify a real challenge and submit it prior to the module. The RE will facilitate a team of about 5 peers (other REs) to identify and assess strategies to meet the challenge. The RE will then implement the strategy whilst maintaining a reflective diary and then produce a stand-alone report on implementation and learning achieved. This will be presented and peer reviewed by the rest of the EngD cohort and it will be completed and lodged as part of the body of knowledge accumulated by the EngD networking centre.
Teaching	The module will be taught as a "master class" with a tutor acting as coach in breakout groups of about 5 people with plenary feed back of learning and performance measurement.
Assessment	Assessment will be of the following submitted on completion of the work: Statement of the problem and strategy for solution or resolution Reflective diary Report submitted to add to the body of knowledge in solving systems problems
Learning outcomes	On completion of the module, the RE will have: <ul style="list-style-type: none"> • demonstrated they know how to formulate and present a systems problem • facilitated a team approach to problem solving and strategy formation • understood the value of peer review as a reviewer and reviewee • used a reflective diary to establish learning during delivery of the problem solution or resolution • produced a report that adds to the body of knowledge of Systems

Annex C – Programme Specification

There are two components to this programme:

- a taught component at Masters level, shown below as Stage 1, which will normally take 2 years to complete and must be completed within 3 years.;
- a research component at doctoral level, shown below as Stage 2.

REs registered at Bristol may exit with either a PG Certificate (60cp) or a PG Diploma (120cp) if they do not wish, or are not permitted, to proceed to the research component. Alternatively the RE may complete 120 cp of taught units and add an MSc dissertation of 60cp and exit with an MSc (180cp). REs should be aware that the Universities operate different credit systems. 10 Bristol credits (CATS) equates to 5/6 Bath credits (ECTS) under normal circumstances

Stage	Level	Unit Code	Unit Title	Core/ Optional	Credit Points		
					Bristol	Bath	
Stage 1: Taught component	All Level M	AENGM0008 (Bristol)	Introduction to Systems Engineering	All Core	All 10	5/6	
		CENGM0006 (Bristol)	Research Methods (1)				
		EMATM0005 (Bristol)	Mathematics of Systems				
		MN50416 (Bath)	Commercialisation of New Technology				
		Specialist option from existing Bristol and/or Bath units			Optional	10	5/6
		CENGM0001 (Bristol)	Advanced Systems Engineering	All Core	All 10	5/6	
		CENGM0007 (Bristol)	Research Methods (2)				
		CENGM0002 (Bristol)	Integrating Engineering and Management Systems				
		MN50420 (Bath)	Technology Strategy and Organisation				
		Specialist option from existing Bristol and/or Bath units			Optional	10	5/6
Total credits (Stage 1)					100	Min 54	
Stage 2 – Research component	D	EngD Research Project		Core	440	216	
Final award: EngD					540	270	
Alternative exit awards	M	2 specialist units from Bristol/Bath options		Core	20	Alternative exit awards available from 2010/11	
	Exit award: PG Certificate (can be obtained during Stage 1)				60		
	Exit award: PG Diploma				120		
M	MSc dissertation with a pass mark of 50%		Core	60			
Final award: MSc					180		

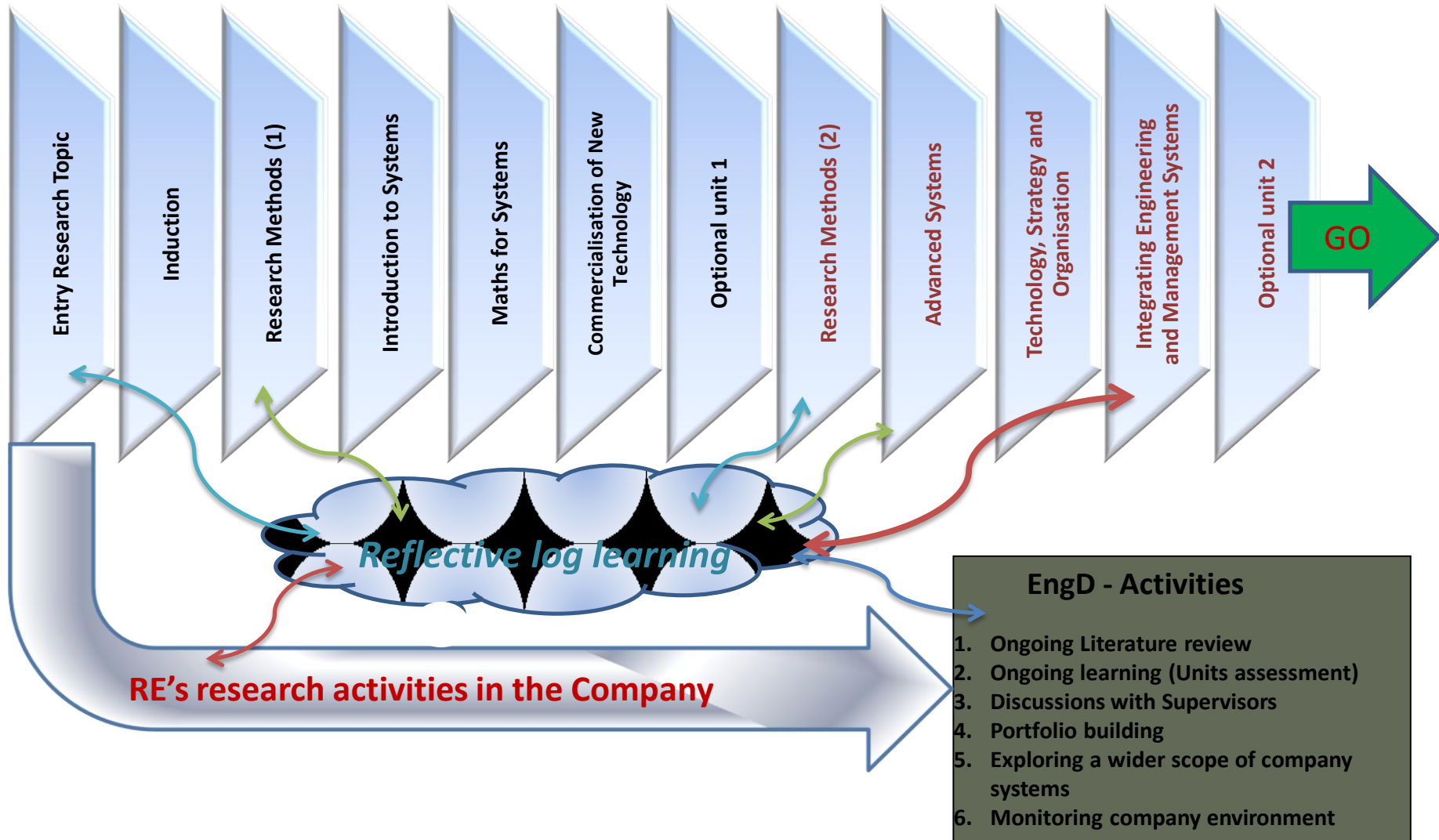
Annex D - A Systems model of Taught Units

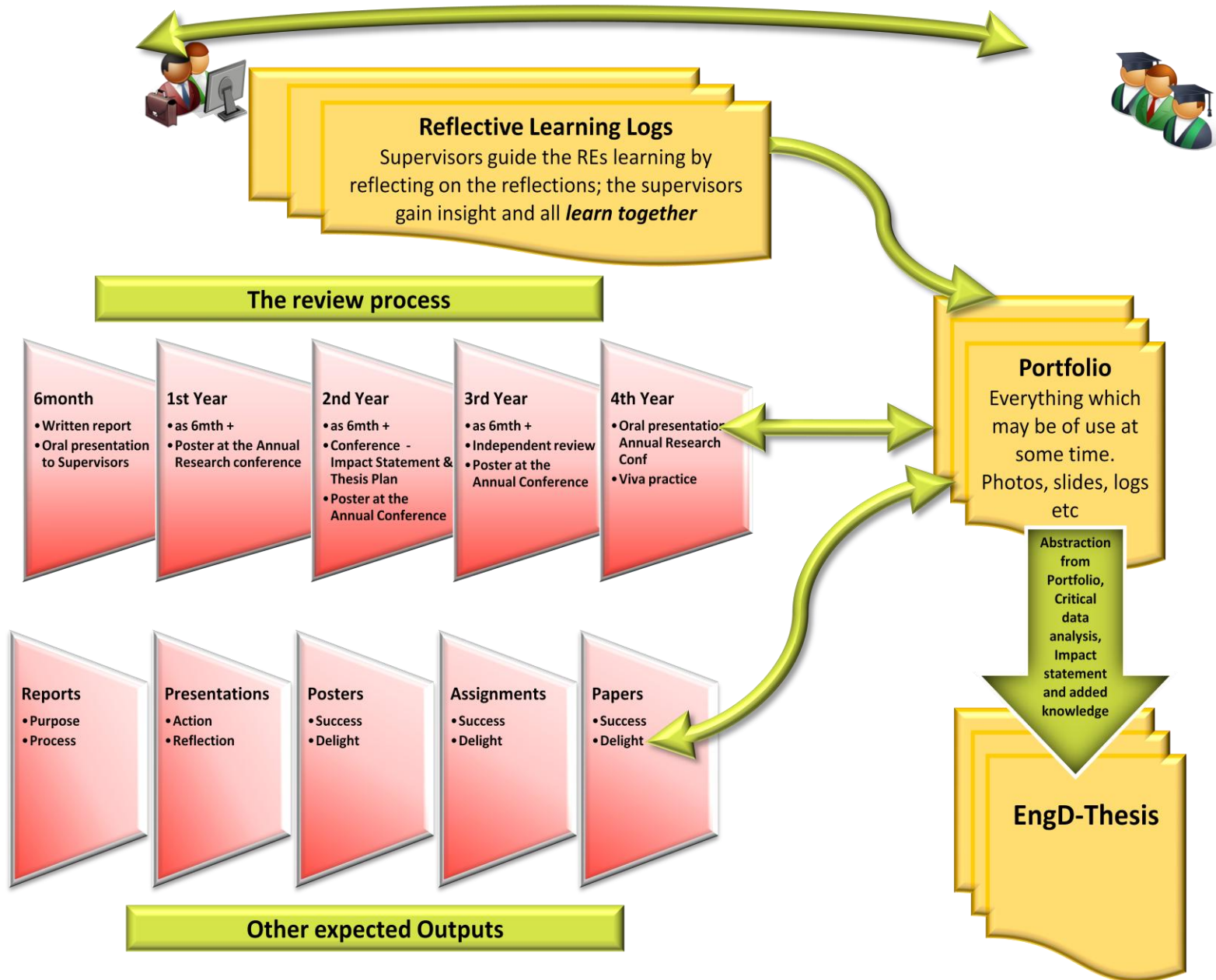
Introductory Taught Units

Advanced Taught Units

Year 1

Year 2





Annex E – Reflective log learning: “Roadmap” of the Journey to the Dissertation

Annex F – Summary of roles and responsibilities

Industrial Doctorate Centre in Systems - Main responsibilities of the Research Engineer, the Academic and Industrial Supervisors and the Systems Centre Staff

Research Engineer(research student)	Academic Supervisor 1- Principal	Academic Supervisor 2- Systems	Industrial Supervisor	IDC Coordinator (Bristol) and Administrator (Bath)	Programme Director(Bristol/Bath)	Systems Centre manager	Systems Centre Director
To register each year with the relevant University.	To provide expert advice and guidance to the RE in the project domain area.	To provide advice and guidance to the RE in the systems domain.	To provide the main point of contact with the Collaborating Company.	To provide the first point of contact for all queries.	To approve offers to candidates.	Overall responsible for all operations (academic and administrative)	To lead and manage the joint Centre.
To comply with all relevant regulations at the University where they are registered and in the company workplace.	To meet regularly with the RE – at least once a month.	To meet with the student at least once every 3 months.	To progress the project within the company and ensure the project remains pertinent to the company's needs.	To provide support for all the academic processes, including admissions, teaching and assessment.	To monitor the overall programme in terms of academic content, coherence and quality.	Ensuring best practice: Duty of Care to all REs, adequate spending of public funds, all processes are fit-for-purpose, and continuous improvement	To liaise between the Universities of Bristol and Bath and to report to them as required.
To take prime responsibility for the progress of their research.	To liaise with the other supervisors and to meet them and the student at least once every 3 months.	To liaise with the other supervisors.	To provide technical and/or managerial advice on the industrial problem being addressed through the Research Project.	To provide administrative support for the Systems Centre.	To deliver the overall programme and monitor communication and feedback between staff and students.	Liaising with other IDC/DTC Centres, on strategic issues,	To liaise with all the industrial partners and to report to the Strategic Advisory Board.
To maintain effective working relationships with their supervisory team.	To make sure the student is aware of the academic standards required for the award of an EngD.	To comment on written work as required and to provide prompt feedback.	To ensure that the RE has the opportunity to apply the knowledge gained from the taught EngD units.	To produce publicity and update all programme information.	To oversee all assessment processes.	Managing Bristol-Bath relationship,	To report to EPSRC as required.
To meet regularly with their supervisory team and to keep appropriate records of these meetings.	To comment on written work and to provide prompt feedback.	To provide a second source of general academic support if required.	To provide professional and career development advice to the RE.	Responsible for REs academic progress monitoring	To review the overall progress at the end of each academic year and advise on development.	Preparing reports/reviews for EPSRC	
To complete taught units as required and to submit work for assessment in a timely fashion.	To offer guidance on preparing the dissertation, up to final draft stage.		To liaise with the academic supervisors and to meet with them and the RE at least once every 3 months.; to provide coherent supervision in line with doctorate degree training and research	Setting up and maintaining databases, e.g. students, academics and industry contacts; REs portfolios overviews		Overall responsibility for client relations, i.e. companies, students Tracking & progressing collaborations from start to signing agreements	
To keep appropriate records of their research and their personal development(Transferable and personal skill s training)	To advise the RE on other sources of support at the University.						