An Institute of Physics guide | **June 2013**

# Group Industrial Projects

## A guide to establishing undergraduate group-research projects with external partners at your university

**IOP** Institute of Physics

The Institute of Physics is a leading scientific society. We are a charitable organisation with a worldwide membership of more than 50,000, working together to advance physics education, research and application. We engage with policymakers and the general public to develop awareness and understanding of the value of physics and, through IOP Publishing, we are world leaders in professional scientific communications.

Written for the Institute of Physics by GRIP co-ordinator,
Dr Jennifer King of Durham University.

# Contents

# Preface

The Institute of Physics, through funding from the National HE STEM Programme, has piloted a programme with the dual aims of promoting stronger links between universities and employers and matching graduates' skills. This programme, the Group Industrial Projects scheme, involves small groups of undergraduates gaining employable skills by tackling real research problems set by external partners.

The Group Industrial Projects build on a similar scheme that has been running at the Department of Physics at Durham University for nearly 20 years. There, the projects are highly rated by participating students and previous participants have been known to return to the scheme as the industrial partner.

> "I think it is the best work I have ever done.
> **Student, University of Exeter**

> "Doing something no other student had done before made the project very exciting.
> **Student, University of Leicester**

The projects see students gaining skills in project management, communication skills and teamwork. They gain a better understanding of the needs of industry, including time and financial constraints on projects, at the same time as developing their skills as physicists.

Participating industrial or commercial partners have the possibility of getting real problems solved, can develop relationships within the participating department and also see the scheme as useful recruiting and public-relations exercises.

The Institute of Physics partnered with nine physics departments to introduce Group Industrial Projects into their undergraduate curriculum in the 2011/12 academic year, with a view to the scheme becoming established as a long-running component of undergraduate physics degrees. A further 10 departments are introducing the scheme in 2012/13.

**Dr Jennifer King**
*Group Industrial Projects Co-ordinator, Department of Physics, Durham University*

1

# History

The Institute of Physics identified the inclusion of group projects working on problems generated by external clients as an example of good practice in undergraduate physics degrees. However, such schemes were not at that time widely implemented in UK physics departments. Funding was secured through the National HE STEM Programme to establish such schemes in nine universities in the UK in the academic year 2011/12. The Department of Physics at Durham University had been successfully running a similar scheme for 20 years and so was contracted to provide a co-ordinating and managing role in establishing the Group Industrial Project scheme in other institutions.

The promising early successes in setting up the schemes in 2011/12, resulted in the securing of additional funds. As a result 10 additional institutions have been funded to establish the scheme in 2012/13. Appendix A (see p17) lists all the institutions that have been funded, with contact details.

*"Students are great to work with as they are very adaptable and approach a problem from a different perspective to someone who is established in the industry."*

**Grace Bramer, Illumination Engineer, Visteon**

# Aims and objectives

The Group Industrial Projects scheme was launched by the Institute of Physics with funding from the HE STEM Programme to encourage the establishment of team-based research projects with external industrial or commercial partners in undergraduate physics courses.

Implementation of the scheme has varied from one institution to another: however so far it has always been third-year undergraduates (either BSc or MPhys students) undertaking the projects. Participating students work in small groups and the completion of the project is a major component of their work for the year. It was considered that such schemes could benefit the participating students, the university departments and the industrial partners.

All projects need an industrial or commercial company or organisation to provide a research project. Partners can range from multinationals to individuals and include other non-commercial organisations such as a local authority or health service. The partner needs to be actively engaged with the projects, and may help by loaning special equipment or providing access to facilities, but is not expected to finance the project.

**Examples of external clients involved in 2011/12**

| | |
|---|---|
| **Multinational companies** | Siemens |
| **Small and medium enterprises** | Graphic PLC |
| **Transport authority** | MerseyTravel |
| **Educational website company** | E-chalk |
| **Governmental bodies** | NHS |
| **Non-commercial organisations** | Leicester Bee-Keepers |

### 2.1. Aims for the participating students

- To give students an insight into "real" research
- To help students gain a better understanding of the needs of industry and the workplace
- To give students a better understanding of the opportunities available to them as physicists
- To encourage students to generate and critically assess ideas
- To give students experience in teamwork and project management
- To encourage self-assessment
- To improve communications skills
- To give experience of managing a budget
- To enhance employability

*"The course has the advantages of real-life interaction with a company, working on team-related skills and writing a report with a broader range than normal."*

**Student, University of Bath**

*"The students successfully modified their behaviour so that they could work as an interdependent team rather than as a group of individuals. This should not be understated as it is a significant enabling competency for their future careers."*

**Dr Paul Bartlett, University College London**

*"They [the students] all felt a great sense of achievement in producing results that impressed professional people outside the university."*

**Dr A Cartwright, Cardiff University**

# 2: Aims and objectives

### 2.2. Aims for the participating universities

- To increase the employability of their graduates
- To offer an exercise that scores high for student satisfaction
- To establish links with local companies and organisations
- To enable departments to make themselves more attractive to potential students
- To make links with potential employers for their graduates

*"Parents are increasingly coming to open days with their children, and asking what links we have with industry."*

**Academic Partner**

*"We believe that the Industrial Group Project scheme can provide an invaluable addition to the education of our undergraduates."*

**Dr J Rogel-Salazar, University of Hertfordshire**

### 2.3. Aims for the participating external clients

- The chance to get a problem solved or to gain fresh insight into a problem
- The opportunity to establish links with a physics department
- A public-relations and recruitment opportunity
- Some free personnel
- Management training opportunities for staff

*"I think that the Industrial Group Project scheme is a great initiative, allowing students to work on and contribute towards 'real-life problems'. Equally, for industry, it allows us to have fresh eyes on the problem tackling it from a different perspective. It also gives us the excuse to look into all those 'nice to do' topics, that are hard for us to find the time to address, or that in a more office-based environment, are hard to look at."*

**Hannah Brice, Magnet Engineer, Siemens Magnetic Technology**

*"It was good experience for me in directing research."*

**Industrial Partner, 2011/12**

# Implementing a Group Industrial Project scheme

In most institutions it would be ideal to allow an academic year for a proposed group project scheme to gain approval from the appropriate committees. This partly reflects the typical progress of getting approval for a new course, but also allows for the fact that the introduction of group work into a degree course is seen as problematic to some academics, and time may be needed for discussion and for a consensus to be reached. It may be worth reminding those concerned about the inclusion of group work, that the accreditation of physics degree courses by the Institute of Physics requires that degree programmes should allow students to experience both individual and group work. Additionally, the Group Industrial Projects scheme allows students the opportunity to develop the personal skills that are required for degree accreditation and for subsequent chartership.

*"Students should develop their ability to work independently, to use their initiative and to organise themselves to meet deadlines. They should gain experience of group work and be able to interact constructively with other people."*

**Institute of Physics, *The Physics Degree*, June 2010**

It is inevitable that an applied physics or even engineering slant to the projects is likely. Again, this is an issue that may be contentious, and may require some time for a consensus to be reached.

Typically, third-year students undertake the Group Industrial Projects. These students may be in the final year of their BSc degree or the third year of an MPhys course. While teamwork could be incorporated into earlier years of a degree course, the involvement of an external client in the Group Industrial Projects makes the involvement of more senior students desirable.

*"The panel heard from many sources that more needs to be done to encourage university-based physicists to work more closely with industry."*

**Extract from the *Wakeham Review of Physics*, RCUK**

# 3: Implementing a Group Industrial Project scheme

The group project is a significant part of the curriculum for the year, typically in the range of 15–30 credits (12.5–25% of the year) and 60–120 hours of work time per student.

An advantage of the Group Industrial Programme scheme is that it can be adapted to fit into existing undergraduate curricula. In the various institutions in which it has been introduced so far, it is usually offered as an alternative to an established research project option that is either conducted individually or in pairs. Typically, the group project option is offered in a way that mirrors the existing research project option – for example, occupying the same proportion of marks for the year, similar number of hours in the laboratory and assessment by similar schemes whether by poster or oral presentation, project report assessment of laboratory books etc. Assessment is discussed in further detail in this report and Appendix B (see p19) contains some example marking schemes.

### 3.1. Finding industrial partners

Finding suitable external partners was expected to be one of the harder aspects of establishing the scheme by many of the participating institutions. In fact, finding clients has usually been easier than recruiting students to participate in an untested course option. Recruitment of students is found to ease once the first cohort have completed the projects.

A local technology-based company may be the obvious choice of a partner but is by no means the only sort of organisation that might have a problem that could be tackled by a group of physics students. External partners could range from individuals to multinationals, and from private industry to government bodies or a non-departmental public body. It is worth thinking broadly; for example, one physics department has approached a zoo as a potential partner.

#### Sources of external partners

- Alumni
- Spin-out companies from your department
- Other spin-out companies – contact the Technology Transfer Department Industrial liaison committee or officer
- Spouses, family and friends of departmental colleagues and their contacts
- Companies and organisations already collaborating with the department
- Large local organisations e.g. transport authority, NHS bodies
- Suppliers of laboratory equipment with whom you have dealings with
- Knowledge transfer networks and partnerships

What is most important is that the partner has reasonable expectations, that the project is well defined and that reasonable progress can be achieved in the time available. It is not necessary that the project must be completed in the time – it can be an option that a project progresses from one year to the next, with a new group of students taking over where a previous group left off.

*"The client was very surprised and pleased by the quality of the work and would like to repeat the project."*

**Dr A Cartwright, Cardiff University**

4

# Recommendations and things to consider

### 4.1. Recruiting students

Many of the institutions that have introduced the Group Industrial Projects as part of this scheme have experienced more difficulty than anticipated in attracting students to sign up. In all of the institutions, however, participation has improved in the subsequent year, as students learn about the benefits of the course option from participating students. Students are usually not enthusiastic about being "guinea pigs" on an untested course, particularly when there are added concerns about how being assessed in a group might affect their final degree classification.

Students are conservative in their course choices. Poor uptake can be expected in the first year of the scheme if it is offered as an optional course choice. Uptake can be improved by making sure that the scheme is presented to the students at the same time as existing course options, so that the scheme is not seen as an add-on.

Actively trying to sell the benefits of the course to students can be worthwhile, and information about the successful implementation of the scheme in other universities with material found in this report may be helpful. Explaining how the assessment scheme will work, so that students are not unduly worried that less able or conscientious peers may drag down their work, will also reassure students.

*"It was great that we had a chance to do this."*

**Student, University of Bristol**

*"At the start of the year I was planning to do an MSc in economics, now I am applying for an MSc in physics."*

**Student, University of Bristol**

### 4.2. Student groups

Whether students are allocated into a project or given the opportunity to choose has varied from one institution to another. Group size has ranged from 2–16 in different institutions, with smaller than optimum group sizes of 2–3 being constrained by the number of students choosing the Group Industrial Projects option. Groups larger than four typically break into subgroups. This can be an advantage in a project with clear experimental and modelling components.

It is useful to recommend that students adopt an official group structure with a chairperson and secretary for meetings. These roles could rotate throughout the project period. A requirement that the students have a regular meeting schedule, which run with a formal meeting protocol, has been found to be useful. This helps to keep the project on track and also gives an insight to the academic assessor about progress and individual contributions.

Additionally, it can be useful to give the students an introduction to project management and leadership issues with a seminar at the start of the projects.

*"The client is trying to recruit a physics student – preferably one of the team if they are available – for a summer placement position to explore some of the ideas arising from the project."*

**Dr C Williams, University of Exeter**

### 4.3. The role of the academic supervisor

All Group Industrial Projects need an academic supervisor or mentor assigned to them. The principal role of the academic supervisor will be as the assessor, for which knowledge of the group dynamics will be necessary. The extent to which the supervisor contributes or oversees the group of students has varied from institution to institution. Supervision is generally with a light touch but occasionally some intervention may be necessary to prevent students heading down a blind alley. Health and safety rules may also require constant attendance by the academic supervisor or an appropriate member of staff in the laboratory.

It could be arranged that groups have to report to the supervisor at regular intervals, or just to leave the students to ask for help if required.

### 4.4. Managing the relationship with the external partner

Once contact has been made with a potential external partner, it is important to spend time considering whether the partner and the project are fit for the scheme. Appendix C (see p20) contains an example document that can be used to explain the scheme to potential external partners. It is important that the partner understands the nature and limitation of the scheme, i.e. that although it is hoped that useful work will be done by the students, they are only undergraduates, and it is by no means certain that a final answer will be arrived at.

It is worth making it clear to the partner that while they need to be prepared to put in some time and effort, and maybe lend specialised equipment if required, they are not being requested to fund the project.

Occasionally, a partner may have an ulterior motive for participating – for example, maybe thinking that they are going to get a piece of equipment bought for them. Dialogue between the academic organiser of the projects and the prospective partner before partnership is agreed will hopefully expose any misunderstandings.

The partner will need to be reminded that since the students are not employees, they should not be exposed to trade secrets without a non-disclosure agreement being in place.

It is important to ensure that the project provides enough material for the students and that reasonable progress can be expected. The supervisor should have a clear idea of what the external partner is hoping for.

It is reasonable to be concerned that the students may make excessive demands on the external partner. It is important to give guidelines to the students and maybe insist that all e-mail correspondence is copied through the academic mentor. However, in practice, it seems that students are more likely not to communicate enough and that many external partners feel that the project could have been more successful if there had been more communication. Often the pleasure of working independently for the first time becomes such an enjoyable part of the project that students forget they are supposed to be working with a partner.

*"...some communication with the industrial supervisor at the time of critical decisions would have been beneficial to ensure that the experiment truly measured/was investigating what was intended by the industrial partner."*

**Hannah Brice, Magnet Engineer, Siemens Magnetic Technology**

# 4: Recommendations and things to consider

### 4.5. Health and safety

Assessing health and safety requirements is an important skill that can be usefully undertaken by the students. However, it is important for the academic supervisors to make an assessment in advance, to forestall any projects with problems that cannot be overcome and to cope with problems that may require advance planning, e.g. access to fume cupboards or other facilities that are not easily available.

Group Industrial Projects may involve new health and safety issues: students will need to be insured for site visits. Additionally, ethical approval may need to be obtained if the project involves people, e.g. some medical-physics projects.

### 4.6. Assessment

One of the most difficult aspects for many institutions in implementing the Group Industrial Projects has been developing an appropriate assessment scheme. In particular, how to apportion the marks between the group and the individual is a challenging judgement. It is recommended that some proportion of the mark be given on an individual basis both to incentivise the individual and to protect their input. Typically a ratio of 70:30 group:individual has been favoured, but this has varied widely.

The mode or modes of assessment can include written reports, oral presentations, poster presentations, marking of laboratory notebooks and records of meetings. All of these could be prepared by either the individual or as a group exercise. An attractive aspect of establishing this scheme is the flexibility to fit into existing practices of assessment. Examples of how the assessment has been carried out at some of the participating institutions can be found in Appendix B (see p19).

It is necessary to decide whether the final report should be a report written for the external partner or as an academic document. Unless guidance is given to the students to aim their report to the partner, which may require writing a less academic document, the students will probably produce a report aimed at impressing the academic assessor. If an academic report is required for assessment purposes, it will be necessary to ensure that alternative suitable output is given to the external partner if an academic report is not appropriate.

The external partner cannot usually be officially involved in the assessment, because of university assessment regulations. However, it may be worth asking the external client for their input.

*"They were one of the most articulate and passionate groups of students I have ever had the pleasure of talking to. They were certainly very motivated by your module [the Group Industrial Projects] and spoke very highly of it indeed."*

**Dr L Spowart, Education Adviser, University of Exeter**

**4.7. Self-assessment and peer assessment**
Using self-assessment and peer-assessment techniques has proved popular. Students can be asked to assess their own and each other's contribution and this has also been used to modify final marks. For example, a particular weighting may be given to a group-prepared final report with the grade varied by up to 10% according to peer assessment.

Students can be invited to nominate other students in their group for extra discretionary marks for exceptional contributions.

**4.8. Security issues**
Some external partners may pose additional organisational issues because of the nature of their activities; for example, companies working in the defence sector or nuclear industry. It might be that some students will not be prepared to work in association with these partners, so it is advisable to always offer less controversial projects in parallel.

Not only may some students refuse to work with some partners but some partners will impose restrictions on the students that they are prepared to work with; for example, they may insist on British nationals. If this is unacceptable to your institution, then it may be possible to work with the partner to select a project area that is not so sensitive. Alternatively, it may be possible to proceed with a more sensitive project as long as no site visit is necessary.

**4.9. Legal issues**
For some institutions, dealing with the legal issues arising from establishing the scheme has been one of the most time-consuming aspects. Whether issues arise will depend on the sensitivities and attitudes of both the academic legal department and the external partner. Most institutions will have a standard non-disclosure agreement that will be adequate. Likewise, most institutions will have regulations in place to cover intellectual property generated by students.

# 4: Recommendations and things to consider

It would be unfortunate if legal issues were allowed to limit the establishment of a Group Industrial Project scheme. On the whole, it is unlikely that significant intellectual-property issues will arise out of short undergraduate projects.

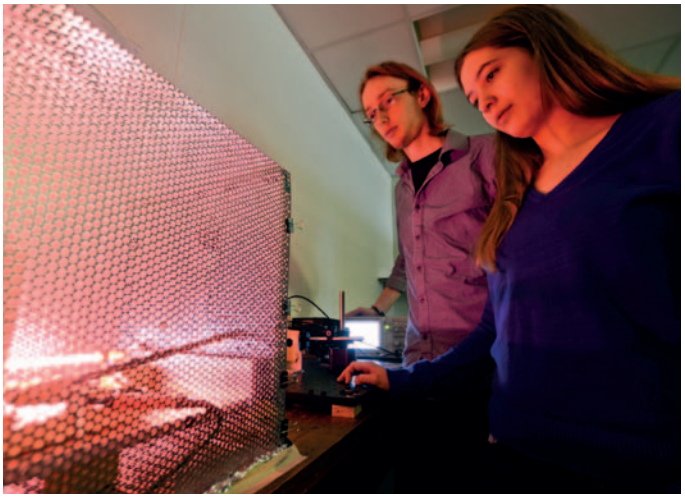
**4.10. Resources**

A strength of the Group Industrial Projects scheme is that there can be an opportunity to give students their first experience of managing a budget for their research. Typically, this takes two forms. Each team can be given a small budget, typically working out at around £50 per head. This allows the purchase of small consumable items and additional travel to the external partner. Alternatively, the students can apply to their academic mentor for items that they need, giving justification and then getting quotations and filling in the appropriate purchase orders etc.

Occasionally, a significant purchase of a piece of equipment may be required. If such a purchase can be foreseen it would be sensible for the academic supervisor to look into its purchase in advance, because lead times might make it impractical to leave such a purchase to the students once they start the project.

*"There has been considerable interest in the concept from a variety of potential project sponsors. It is clear that the module is meeting the original aims of the Institute of Physics and that in addition to preparing students for a wide range of careers the module has the potential to foster close links between the physics department and commercial and public-sector organisations ..."*

**Prof. Peter Weightman, University of Liverpool**



# Appendix A: Participating universities and contact list

**Contact list for IOP HE STEM Group Industrial Projects**

1. School of Physics, University of Exeter
   Dr Charles Williams, 01392 264178
   c.d.h.williams@exeter.ac.uk

2. School of Physics and Astronomy, Cardiff University
   Dr Annabel Cartwright, 029 20 870167
   annabel.cartwright@astro.cf.ac.uk

3. School of Physics, University of Bristol
   Prof. David Cherns, 0117 928 8702
   d.cherns@bris.ac.uk

4. School of Physics, University of Birmingham
   Dr Peter Jones, 0121 414 4677
   p.g.jones@bham.ac.uk

5. Department of Physics, University of Bath
   Dr Frances Laughton, 01225 384361
   f.r.laughton@bath.ac.uk

6. Physics Department, University of Liverpool
   Dr Peter Weightman, 0151 794 3871
   peterw@liverpool.ac.uk

7. Department of Physics and Astronomy, University of Leicester
   Dr Graham Wynn, 0116 252 2071
   gwy@leicester.ac.uk

8. School of Physics, Astronomy and Mathematics, University of Hertfordshire
   Dr Jesus Rogel-Salazar, 0170 728 4197
   j.rogel-salazar@herts.ac.uk

9. Department of Physics and Astronomy, University College London
   Dr Paul Bartlett, 020 7679 3963
   paul.bartlett@ucl.ac.uk

10. Department of Physics, University of York
    Dr Alison Laird and Dr Kate Lancaster, 01904 322240
    alison.laird@york.ac.uk
    kate.lancaster@york.ac.uk

# 5: Appendix A

11. Department of Physics, University of Hull
    Dr David Sands, 01482 465826
    d.sands@hull.ac.uk

12. School of Physics and Astronomy, Queen Mary University of London
    Dr Theo Kreouzis, 020 7882 3432
    t.kreouzis@qmul.ac.uk

13. Department of Physics, University of Oxford
    Dr Karen Aplin, 01865 273491
    k.aplin1@physics.ox.ac.uk

14. Department of Physics, Lancaster University
    Dr Manus Hayne, 01524 593279
    m.hayne@lancaster.ac.uk

15. Department of Physics, University of Surrey
    Dr James Adams, 01483 682723
    j.adams@surrey.ac.uk

16. School of Physical Sciences, University of Kent
    Dr George Dobre, 01227 823234
    g.dobre@kent.ac.uk

17. School of Physics and Astronomy, University of Leeds
    Dr Samantha Pugh, 0113 3432985
    s.l.pugh@leeds.ac.uk

18. School of Computing, Engineering and Physical Sciences, University of Central Lancashire
    Prof. Derek Ward-Thompson, 01772 893540
    dward-thompson@uclan.ac.uk

19. School of Earth and Environmental Sciences (Applied Physics), University of Portsmouth
    Dr Chris Dewdney, 02392 842417
    chris.dewdney@port.ac.uk

20. Department of Physics, Durham University
    Prof. Paula Chadwick, 0191 334 3560
    p.m.chadwick@durham.ac.uk

# Appendix B: Examples of assessment schemes

**1. Example of an assessment dominated by a group mark**

| Group assessment | Weight (%) | Notes |
|---|---|---|
| Group meetings | 10 | Meeting observations by department supervisor |
| Ideas pitch | 5 | Marked by department supervisor |
| Group report | 20 | Marked by department supervisor |
| Oral presentation | 20 | Marked by department supervisor |
| Company feedback – ideas pitch | 5 | All company assessment was moderated by department supervisor |
| Company feedback – oral presentation | 10 | |
| Company feedback – team performance | 10 | |
| **Group mark total** | **80** | |

| Individual assessment | Weight (%) | Notes |
|---|---|---|
| Individual meetings | 5 | Meeting observations by department supervisor |
| Individual summary | 10 | Marked by company, moderated by department supervisor |
| Peer feedback | 5 | Feedback from team-mates |
| **Individual mark total** | **20** | |

**2. Example of an assessment dominated by an individual mark**

| Group assessment | Weight (%) | Notes |
|---|---|---|
| Management plan | 5 | Marked by department supervisor |
| Project seminar | 15 | Marked by department supervisor<br>External client present |
| **Group mark total** | **20** | |

| Individual assessment | Weight (%) | Notes |
|---|---|---|
| Worksheet (solving of related problems) | 10 | Marked by department supervisor |
| Individual summary | 10 | Marked by department supervisor |
| Project report | 40 | Each student contributes to group report and submits a personal statement |
| Project work | 20 | Based on assessment by staff and in consideration of the self and peer assessments |
| **Individual mark total** | **80** | |

# Appendix C: Generic document for potential external partners

IOP Institute of Physics

National HE STEM Programme

## Institute of Physics/HE Stem Programme Group Industrial Projects scheme

Guidance notes for prospective external partners

**The aims of the scheme**

The Group Industrial Projects scheme has been launched by the Institute of Physics with funding from the Higher Education STEM (science, technology, engineering and maths) Programme to encourage the establishment of team-based research projects with an external industrial or commercial partner in undergraduate physics courses. Such projects are considered to be an example of good practice, and build on a similar scheme that has been running successfully in the Department of Physics at Durham University for over 20 years.

The aims of the projects are:

- To give students an insight into "real" research
- To help students gain a better understanding of the needs of industry and the opportunities available to them as physicists
- To give students experience in teamwork and project management
- To encourage self-assessment
- To improve communication skills

The partner gains:

- The chance to get a problem solved or to gain fresh insight into a problem
- The opportunity to establish links with a local physics department
- A public relations and recruitment opportunity
- Some free manpower!

**Who is the external partner?**

All projects need an industrial or commercial client or organisation to provide a research project. Partners can range from individuals to multinationals and can include other non-commercial organisations such as a local authority. The partner needs to provide some effort and input to the projects but is not expected to finance the scheme.

**How the projects work**

Implementation of the scheme will vary from one institution to another. However, third- or fourth-year undergraduates usually undertake the projects. Students work in small groups and the completion of the project is a major component of their work for the year. Students are required to meet together on a regular basis.

The students are provided with a staff consultant from their department whose role is to facilitate the project and also to assess the students' work. They are also provided with lab space, basic laboratory equipment and a small budget for the purchase of equipment, consumables and travel.

Student teams meet with the partner at the beginning of the project. At the end of the project they provide an oral presentation and a copy of their report to the partner. If the project has required that they build a piece of equipment, this is normally given to the partner too.

**Input from partners**

Partners need to:

- Provide a short brief for the students to read before the initial meeting that provides details of the problem and some background information
- Meet with the students at the start of their project, ideally at the partner's place of work
- If necessary, be prepared to loan specialised equipment to the university or allow access to it
- Be prepared to answer e-mail queries from the students and possibly undertake a mid-project review
- Listen to the final presentation
- Read the students' final report and provide feedback for the academic staff member marking the project. Partners will not be expected to take part in the formal assessment of the work

**Typical projects**

The aim of the scheme is that "real" problems are provided rather than exercises. The projects should be problems to which the partner would really like an answer but perhaps haven't got the time, resources or expertise to pursue. They can be blue skies projects on which some fundamental investigation is required, testing of new devices or materials, or questions that would benefit from a fresh perspective.

Quite often, students are working with partners who have no physics expertise in-house but who have a problem that needs some physics input. It is inevitable that there is likely to be a strong applied or engineering dimension to the research.

A selection of recent projects is listed below:

- Developing online educational resources for A-level physics
- Optimisation of traffic flow with a traffic authority
- Assessment of sensors with a local hospital
- Characterisation of light guides with an international manufacturer
- Optimising beehives with a bee-keeping organisation

**Things to bear in mind...**

Group Industrial Projects can be an effective way of performing a preliminary investigation, getting equipment or software produced or even finding a solution to a problem. However, partners should be aware that the groups are composed of students. Some of them will be better than others and they will all be new to research. Although it is usual for the groups to perform well there is no guarantee that an answer to the problem will be reached. If progress is promising but the problem not solved in the lifetime of a single group project, then it would be possible to have a follow-on project with a new group of students in a subsequent academic year.

**Contact details**

Dr Academic Co-ordinator
Department of Physics
xxxxxxxxxxxxx University
Tel xxxxxxxxxxxx
E-mail xxxxxxxxxxxxx

Group Industrial Projects Co-ordinator
Dr Jenny King
Department of Physics
Durham University
E-mail jennifer.king@durham.ac.uk

A word version of this letter is available at the Group Industrial Projects web page, www.iop.org/grip.

8

# Acknowledgements

The Institute of Physics worked with the Physics Department at Durham University to implement the Group Industrial Projects scheme in physics departments across the country. Prof. Paula Chadwick, who runs a similar scheme at Durham, oversaw the implementation of the scheme. Dr Jennifer King was the Group Industrial Projects co-ordinator, taking over from Dr Helen Cramman, and is the author of this report. At the Institute of Physics, the scheme was managed by HE STEM managers, Dr Saher Ahmed and James McNish, and with support from Angela Townsend.

**The following people were also instrumental to the success of the scheme**

**Group Industrial Projects Academic Supervisors, 2011/12:**

- **Dr C Williams and Professor T Naylor**, School of Physics, University of Exeter
- **Dr J Rogel-Salazar**, School of Physics, Astronomy and Mathematics, University of Hertfordshire
- **Dr A Cartwright**, School of Physics and Astronomy, Cardiff University
- **Prof. D Cherns**, School of Physics, University of Bristol
- **Dr P Jones**, School of Physics, University of Birmingham
- **Dr F Laughton and Dr P Mosley**, Department of Physics, University of Bath
- **Prof. P Weightman**, Physics Department, University of Liverpool
- **Dr G Wynn**, Department of Physics and Astronomy, University of Leicester
- **Dr P Bartlett**, Department of Physics and Astronomy, University College London

The Institute of Physics would like to acknowledge that this work was part of the National HE STEM Programme, which was funded by HEFCE.

**IOP** Institute of Physics
76 Portland Place
London W1B 1NT, UK
Tel +44 (0)20 7470 4800
Fax +44 (0)20 7470 4848
E-mail HESTEM@iop.org
www.iop.org
Registered charity no. 293851



The Kitemark is a symbol of certification by BSI and has been awarded to the Institute of Physics for exceptional practice in environmental management systems.

Certificate number: EMS 573735